SUGARS, DATE AND CANE.

Date.

Furreedpore occupies a foremost place as a sugar-producing district, although in other respects its claims to commercial or agricultural importance are dubitable. The soil is not unfavorable to the growth of rice, but the cultivation of that grain, although of superior value as an article of food, has been in a manner greatly replaced by that of sugar, as being a more profitable and otherwise a richer crop of the two. The consequence is, that to meet the deficiency thus created by the competition, or, as it were, the encroachment of a more successful crop, the staff of life has largely to be imported, specially all the better sorts of it, from elsewhere or the bordering districts. Jute, safflower, oil-seeds, &c., have further encroached upon rice, but the sugar dominates over all in this respect—not only as having engaged the largest area of cultivation, but for its value as an article of export. Judging from the vast number of date plantations one meets with wherever he turns his eye or directs his foot (there is scarcely a house or hovel which cannot boast of a few date trees of its own, besides those at a distance), the extensive fields of sugarcane which alternate with or fill up the gaps left by the date, and the numerous sugar factories scattered over the district, it is not too much to say that nearly every inch of its soil either produces, or is capable of producing, this important raw material. In many villages the entire population is engaged in the manufacture or some dealings connected with it, while there is scarcely a single hamlet or rural community in which the better part of the laboring classes do not take a share directly or indirectly in its culture. The quantity of *gur* or raw sugar manufactured in the district is something considerable, and can, at the lowest estimate, hardly fall short of three or four lakhs of maunds as the average produce of a year for the whole district. The sugar produced in the district is either from the cane, *Saccharum officinarum*, or the date, *Phœnix sylvestris*.

Cane.

Two varieties are grown in the district, viz. a dark purple kind, called *kájole*, and a yellowish white species, known as *dhol sundor* or *sadá kusar* or *úuck*. No attempt seems to have as yet been made to introduce any of the superior varieties of cane, although it is doubtful if any innovation, either as regards the old plant or the present modes of culture, will ever prove acceptable to the ryot, who generally being a person of no great capital of his own, prefers a tolerably fair and certain return for his little outlay with as little trouble to himself as possible, to large profits requiring considerable pecuniary investments, which they can but ill afford, and many risks, which he thinks it wiser not to encounter at all. In the cultivation of sugarcane little or no manure is used, excepting a few handfuls of cattle dung thrown here and there during the preceding rains, when the land is left to fallow; and if the yield is a good one, which it generally is, it is more owing to the rotation of the crop and the careful ploughing and pulverizing of the soil, in which the ryot is very particular, before the young shoots are put in the ground, than to any superiority of his agricultural skill or his method of culture. During the growth of the plant the only care required is to tie or roll up from time to time the growing stalks with their own leaves, so that they may not be uprooted by storms, and sometimes to pick out a species of larvæ, which drills into the young cane, causing extensive havoc afterwards if not thus timely guarded against. The manner of cutting the cane, extracting the juice, and the rude forms of press used in this country from time immemorial, has been well described by Dr. Ure in his Dictionary of Arts and Manufactures, to which reference should be made for this part of the subject, as it would apply without any variation to the method adopted in the district. The two forms of sugar mills used here, viz. a vertical and horizontal form of screws, will be best illustrated by models sent.

Process of boiling the juice.

The boiling apparatus, consisting of a number of earthen pots, each in the shape of an inverted cone, instead of being placed in an extended line, as in Dr. Ure's diagram, is arranged in a circle over a fire-place, which is a cavity of considerable dimensions dug in the ground and covered over with a clay roof or ceiling, having as many holes as there are pots to be inserted. The juice is never poured or spooned out from one vessel to another, as shown in Dr. Ure's book; such a course or shift being, by the modified construction of the fire-place quite unnecessary, as all the boilers here, from their circular disposition, receive heat equally. The fuel used is the dried leaves and refuse of the plant after the juice has been extracted. It is a well known fact that the manufacturers of sugar generally prefer the pot-extract to the *gur* in the cake form; this appears to be done more from a regard to the process they adopt for refining, as well as from consideration of the time of the year during which that process is effected than any other reasons. See further on, when we come to the process of refinement, which is the same in both the varieties of the cane and date sugar.

Mode of extraction of the date-juice, or tapping the tree, as it is called.

Tapping is the operation by which the juice is obtained from the date-tree. It is done at the top of the trunk, a little below the part called the growing point (*máthi*), by making a few longitudinal incisions and joining them with a transverse one at their inferior termination in the shape of a crescent, in the centre of which a piece of slit *kanchi*, branch of a bamboo, is fixed to serve as a drain or spout for the liquid to trickle down into a vessel or receiver placed below it. If it be not the first operation, that side of the plant is selected which is opposite that in which the cutting was done in the previous year. When a tree is prepared for extracting the juice, or *rash* as it is called, the cut surface resembles as nearly as possible the smooth convex plane of a horse's hoof. This is, however, worn out into an irregular concavity in the course of the season by the shaving it has to undergo either every other day or consecutively for three days, alternating with a rest of as many days, so as to present a fresh surface at each time, which is essential to a renewal of the flow. The exudation takes place both during the day and night for 24 hours after each shaving; but latter is the time for collecting the juice, not only on account of its being then the most copious, but also for its containing more saccharine matter, especially the crystalizing element. The liquid gathered in the daytime is weak in sugar, which is boiled down into an inferior kind of *chita*, used principally in the preparation of cake or huka tobacco. The operation of tapping is only performed during the cold weather, and the yield is according to the intensity of cold. The quantity and quality of the juice will, however, vary greatly according to the age or the health of the plant, the length of rest given, and the various meteorological changes which affect the temperature of the soil and atmosphere. A strong healthy tree will yield as much as twelve seers of juice, if not more, throughout the season daily, while weakly, aged, and very young plants, would hardly give two or three seers daily in the same time. The average yield may be set down to about five seers per tree daily. Rest is essential to a generous yield of the *rash*. In this part of the district they cut for three days in succession, allow three days' rest, and then commence again on the seventh day, and so on; and it is observed that the juice obtained on the first day after a rest is not only the largest in quantity, but of the best quality, and that the quality gradually grows weaker on each succeeding day, until by a further repose the tree is allowed to recruit itself again.

The state of the weather will likewise affect the production of the date: in a bright, clear day, when the cold is also intense, the exudation is both copious and rich; in cloudy weather the same is equally abundant, but less sweet: and if there be wet or rain, it is perhaps still more abundant, but almost tasteless. The same decrease of the saccharine principle is also observed as the cold is replaced by the higher temperatures of the spring and summer. Heat is not only injurious to the formation of sugar in the living tree, but seems also to interfere in some manner with its subsequent tendency to conversion into the granular state when removed from the sphere of life. It is thus we find that the juice when boiled over a strong fire loses its power of crystalization to a great extent. The deteriorating effect of heat is further recognized in the retrogressive changes that occur in the prepared gur while refining it by re-boiling, which, if carried on too long, may entirely convert it into molasses or uncrystalized sugar. The transformation of sugar from its granular to the syrupy state belongs to the same order of changes.

Process of refining.

The process of refining sugar is the same, whether it is obtained from the juice of the date or of the cane. As has been observed, the gur manufactured from the date or cane is made in two forms: either as hard cakes, known as patali, or cake extract or of the consistency of honey, which being preserved in earthen pots, is known as pot or hari extract. Sometimes the hard kind is also kept in pots to secure it more successfully against damp. The cake extract cannot be kept long, and therefore is the first made use of in making sugar. In a humid climate like that of Eastern Bengal, a part of it is sure to be damaged if allowed to remain in this state during the rains. The pot extract, on the contrary, is capable of preservation as long as it is desirable. There is another advantage with the gur made in the form of pot extract, viz., on account of less heat being required in its preparation, it produces proportionally a larger quantity of granular sugar than obtains with the other variety, the solid particles separating themselves into a large crystalline mass at the bottom of the vessel in which the extract is preserved. All that is now necessary to do, is to place the solid mass in stout gunny or sackcloth bags and squeeze out the remaining molasses, partly by twisting and tightening the mouths of the bags, and partly by laying weights upon them for additional pressure. The article thus produced is of a brownish colour, and usually known as katcha or cold sugar, in contradistinction to a like variety of the raw product prepared by the application of heat. By far the largest quantity of sugar, however, in the district is manufactured in a different way. The process, rather a cumbrous one, is as follows. The gur, generally the cake extract, is at first boiled with a certain proportion of water in a large iron vessel or karai, a quantity of diluted milk being added from time to time to separate the impurities, which are skimmed off as soon as they form on the surface. When no more skim appears, the thickened liquor is poured into a number of circular earthen pots or strainers, made wide at the top and pointed below, with a hole in the centre, popularly called bharnis, and thus left for two or three days in the open air to cool. It is then removed to the refining house, where the final separation of the solid crystalline portion from the treacle is effected. The straining pots are generally arranged in rows on a bamboo frame at a certain height from the ground, and earthen pitchers are placed under each to receive the molasses as it slowly drains from the refining pot above. To complete the arrangement, as well as to quicken the operation, fresh moist leaves of a water weed called *patta ghass* or *patta shewállá* (a species of Valisnaria), are now placed on the top of the refining pot, and as soon as a layer of sugar from 1 to 2 inches thick is formed at the top, it is removed by scraping with the knife, fresh *patta ghass* being laid on the remainder and the same tedious process is repeated several times until the entire quantity of sugar is made. The native confectioner makes extensive use of this sugar for the purposes of his art; but before it is fit for use, it has to be clarified again by further boiling with the addition of a solution of milk as in the last process. When this is allowed to cool, it forms a hard crust, which requires to be broken and pounded before it can be employed; hence the name of patta sugar applied to it. The molasses is employed for preparing huka tobacco, inferior sorts of *murkis, moahs, chaktis, &c.* (see Sweetmeats), and the rest is sold for use in the distillation for making country rum. There are two other kinds of gur known in the district, I might say throughout Lower Bengal, in much request for ordinary home consumption, viz. the *patali* gur and the *poira* gur; the former is simply the cake extract made in the form of flakes or plates of variable thickness; on the other hand, the latter is a pot extract of the date, the extract being made with slower heat, and a little thinner than usual, and with the best and richest juice that can be procured.

Madhu—Honey.

This is perhaps the proper place to offer a few words regarding honey, which is occasionally used in the district either as an article of food or as a pharmaceutical agent. It would be needless to enter into the history of the insect (Aphis mellifica) that produces it, whence it is originally derived, how subsequently it is elaborated, &c. Suffice it, however, to say that two varieties of bee exist in these parts, distinguished by one being smaller sized than the other, and that it is the neuters which collect this useful substance. The small bee is very rare, and only now and then to be found in some gardens. It generally produces the best kinds of honey, and it is believed that padma madhu, which is derived from the melliferous disks of the water-lily, so much prized by the natives, is collected by this bee. The ordinary kind of madhu of the district, however, obtained from the common bee is of a very inferior quality, looking more like treacle, and being sometimes bitterish and nauseous, is positively useless. Madhu is much employed as an *unupan*, or vehicle for administering native medicines, especially those in the pill form.

MUCILAGINOUS ALIMENTS.

Under this class are included all those vegetable substances employed as food which hold mucilage or gum, or in their further metamorphosed forms pectine or pectic acid (vegetable jelly), as predominant principle in their composition. Hence to this class will belong all greens, pot herbs, or the garden vegetables properly so called; and as such, they play no insignificant a part in the nourishment of man in all countries, more especially in the tropics, where the inhabitants have to subsist for the most part on a vegetable dietary. These aliments are naturally so numerous, that for convenience they would be best considered according to the part or parts of plants which usually furnish them, such as leaves and tender shoots of plants, branches and stems, flower and flower stalks, fruits, roots, and rhizomes and bulbs.

Leaves and tender shoots of plants—sags and daggás.

These constitute a very numerous class of pot herbs or greens among the natives. Everything green and tender, provided it is not positively noxious or fœtid, is in fact, I may say, so used. Those most commonly employed, however, in the district are as follows:—Three varieties of nates (নটে শাক)—Amaranthus lividus, A prostratus, and A polygamus; the *kalmisag* (কলমি শাক), Convolvulus reptans; *matarsag* (মটর শাক), Pisum sativum; *kachusag* (কচু শাক), Arum colocasia; *mula* (মুলা), Raphanus sativus; *palangsag* (পালঙ্গ শাক), Beta bengalensis; *puinsag* (পুঁই শাক), Basella lucida; *laoodogga* (লাউ ডগা), Lagenaria vulgaris; *kumradagga* (কুমড় ডগা), Cucurbita pepo; *shamla* (শামলা নাল), petioles of water-lily; *sajinasag* (শজিনা শাক), Hyperanthera moringa; *susnisag* (শুশুনী শাক), Marsilia dentata; *mathisag* (মেথী শাক), Nigonella fœnum gœcum; *sulfisag* (শুলফে শাক), Anetheum sowa; *patsag* (পাট শাক), Corchorus olitorius; *oldanta* (ওল ডাঁটা), tender shoots of Arum campanulatum, &c.

These sags are eaten either boiled, fried, *ghanta*, or *chhechki*.—See Native Cooking.

Branches and stems.

The juicy succulent branches of some of the plants in the preceding group are often made use of as culinary objects. They usually form the basis of most *churchoris*.

Flowers and flower stalks.

The flowers of the sajna, and those of the gourd and pumkin, are eaten—the former made into ghanta, and the two fried and put in curries. The unexpanded spadix of the plantain and its long tender inclosed stalk, *mocha and thor*, are likewise employed in a similar manner. *Mocha* is by no means an unwholesome or unsavoury vegetable if properly cooked.

FRUITS.

The following list includes all fruits employed for culinary purposes :—

Mitkumra (মিঠে কুমড়া)—*Pumkin.*
Lau (লাউ), *kadu* (কদু)—*Lagenaria vulgaris.*
Kankur (কাঁকুড়)—*Cucumis momordica.*
Khira (খিরা), *sossa* (শশা)—*Cucumber.*
Dhundul (ধুঁদল)—*Luffa pentandra.*
Jhinga (ঝিঙ্গে)—*Luffa acutangula.*
Kakrol (কাকরোল)—*Luffa racemosa.*
Srichundon (শ্রীচন্দন), *chichinga* (চিচিঙ্গা)—*Icosanthes anguinia.*
Patal (পটল)—*Luffa diæca.*
Dharosh (ঢাঁড়োশ)—*Hibiscus esculenta.*
Bygun (বেগুণ) *Solanum melongena.*
Katch Kala (কাঁচকলা)—*Green plantains.*
Dumur (ডুমুর)—*Ficus carica.*
Papeya (পেঁপে)—*Carica papeya.*
Etchor (এঁচোড়)—*Green jack fruit.*
Sajna dantá (শজনে ডাঁটা)—*Hyperanthera moringa.*

As the report is getting voluminous, a detailed account of these fruits may be omitted.

Roots and rhizomes.

The raddish, the tender roots of palungsag, the common and the sweet potato, the zams, the ol, the mankachu, and the guri and gatch kachu (Arum colocasia and Arum esculenta), may be mentioned as belonging to this division of mucilaginous foods.

Bulbs.

The bulbs in common use are the onion (*Allium ascalonicum*) and garlic (*Allium sativa*). They are extensively cultivated and consumed. I need scarcely say that the Hindus are strictly prohibited to eat onions.

ACIDULOUS ALIMENTS.

Man has an instinctive appetite for acid aliments, and it seems this innate longing is in proportion to the best of the climate in which he dwells. The principal acid used in the districts are the *tamarind*, the *karamcha*, the *mastha*, the *kul*, the *green mango*, the *chalta*, the *amra*, the *katbél*, the *sore*, the *noari*, the *nimbu*, and vinegar.

Tamarind (*tentul*)—*Tarmarindus indicus.*

The natives of the district are not much used to acid things, but still, when requiring an acid, it is the tamarind which they usually have recourse to. It forms the basis of most of their *ambals* (acid curries), and it is this acid also they prefer to all others in making their various acidulous sherbats, pickles, and *chatnis*. Tamarind is slightly laxative: hence it is of use when mild purgatives are required. Its sherbats are the most cooling and agreeable in inflammation and febrile affections, and prove not the less grateful as an ordinary drink in the hot weather.

Karamcha (করমচা)—*Carissa carandas.*

The plant is not uncommon, and its red acid fruits are well known but seldom much made use of. The same remark applies to kamranga (কামরাঙ্গা) *Averrhoa carambola*, the Indian sorrels, *chuka palung* (চুকাপালঙ্গ) and *amrul*, *Rumex vesicarius* and *Oxalis corniculata*, and *noari* (নায়ারি) *Phylanthus charamella.*

Mástha (মেস্তা)—*Hibiscus sabdariffa.*

The whole plant is mucilaginous and pleasantly acid. It is, however, the red fleshy persistent calyces which are used. A few of these put in curries will suffice to give them an agreeable acid taste.

Kul (কুল)—*Zizyphus jujuba.*

This tree is very common, and yields a round sub-acid cherry-like fruit, which is extensively used. In the green state the native plum is not wholesome, but the same objection does not apply when the fruit is ripe. It is eaten either raw, sometimes with a little salt, or stewed as an ambal. The *kulchur* (কুল চুর), a preserve of the ripe fruit prepared by crushing and salting and then drying it in the sun, is in considerable request in consequence of its delicious flavour and as an appetizer. In this form it may be used as a most wholesome acid. The variety of native plum known as *narikel kul*, a long sweetish fruit, is also met with here and there.

Green mango.

In the green state mango is extensively employed for its acid qualities. Large quantities of the fruit are eaten raw or in a stewed dish, and a still larger quantity is preserved for future use in the following forms:—

Amsi (আমশী).

This is simply the flesh of the green mango cut in slips and dried in the sun previously sprinkled with a little salt.

Kasundi (কাসুন্দী).

This is the celebrated mango chatni or acid preserve of Bengal, and is made by mixing mashed unripe mango with powdered turmeric and mustard-seed and salt, and sometimes also a little tamarind. The process of making it is a very tedious one, and takes days and weeks to finish it; the quality always depending on the care and punctuality with which the mixture is made at its different stages, as the ingredients have to be added in varying proportions at each stage, and the least error committed at one will interfere with the success of the whole preparation.

Tél Am (তেল আম).

This, as the name implies, is mango kept steeped in oil; that of mustard being always used. Previous to immersion the unripe mango is slit up on one side to remove the young kernel, and the void thus made is filled up with a roughly ground paste consisting of chillies, turmeric, ajwan, mauri, kalijira, methi, and salt.

Chalta (চালতা)—*Dillenia indica.*

Amra (আমড়া)—*Spondias mangiferd.*

Katbél (কতবেল)—*Feronia elephanta*

These trees are not very common in the district. In the chalta the large persistent sepals are the parts made use of, both in the green and ripe state. The ripe sepals are sometimes ground down and made into a fairly palatable preserve with gur or sugar. The amra is not an unpleasant acid. *Katbél* is fœtid, but makes a good chatni with other ingredients.

Nebu (নেবু).

Nebu is a general term applied to all fruits of the order aurantiacæ: hence citrons, lemons, the shaddock, and orange, are all nebus. The varieties indigenous to the district are the kagchi and pati nebus, the jungle nebu, and the batabi nebu (pumplenose). They all owe their acidity to citric acid contained in their pulp. The first two varieties are much resorted to either for making sherbats with sugar or salt, or to impart an agreeable acid taste to rice. The usual way to use them is to cut the nebu into three slices vertically, to admit of taking out the central tough placenta, and then to squeeze the juice between the fingers into the sherbat or the dish of rice. The juice is cooling, stomachic, and powerfully antiscorbutic. The pumplenose, when ripe, contains a cooling sub-acid juice, used more as a dessert than lime.

Vinegar.

Not much used in the district. The country vinegar is made from either the cane or date juice—the cane is the best—by exposing it to the sun in a glazed or impervious vessel well covered up at the top by a piece of cloth, sometimes adding a little charred barley or gram to give the usual color, until it gets quite sour by acetous fermentation, which soon sets in.

PICROUS OR BITTER ALIMENTS.

There are many bitter substances in common use among mankind, which either possess nourishing properties in themselves, or, when added to other esculents, render them thereby more agreeable and adapted for food than before. They should therefore require a separate consideration. The bitter substances used as food in the district are the following :—

Karela (করলা), *pâltá* (পল্‌তা), *nim* (নীম), *nalte* (নাল্‌তে), *betdaga* (বেতডগা), and *helanch or hincha* (হেলেঞ্চা এবং হীঞ্চে).

Karela (করলা)—*Luffa amara vel momordica charantia.*

This cucurbitaceous plant is largely cultivated for its succulent bitter fruit, which is much consumed by the people. Two varieties are known; one egg-shaped from one to two inches long, the other from three to four inches long, and both tapering at the ends and covered with little tubercles. They are most common during the early rains. Eaten fried, stewed, and curried.

Palta (পলতা)—*Trichosanthes diœca.*

The young leaves and the tender shoots and branches of the plant are used under this name. They are bitter and slightly alimentary, and supposed to possess antibilious properties. The palta juice, or broth prepared from the leaves, is an indispensable article of diet in the native sick room, and often the first food allowed to the sick and convalescents.

Nalte (নালতে), *or tiktapât* (তিক্তাপাত)

These are the dried leaves of the bitter jute plant *Corchorus fuscus*, much used either as cold infusion alone as a bitter stomachic, like chiretta, or to impart a pleasant bitter flavour to some native curries. The nalte contains an appreciable quantity of mucilage combined with its peculiar bitter, and in this respect it might serve as very fair native substitute for the well known Ceylon moss.

Helanch (হেলেঞ্চা).

The tender terminal branches of this plant are extensively eaten as a bitter sag. It is said to possess strong antibilious properties.

Nimpatta (নীমপাতা)—*Melia azadirachta.*

The young leaves of the nim are much prized for their giving an agreeable bitter aroma to some native dishes. As a preliminary to their use for this purpose, they must be fried crisp in oil and then put in curries.

The Bet dagga (বেত ডগা,)—*Calamus rotang.*

The tender growing points or tops of the bet are likewise sometimes employed as other substances of this class.

CONDIMENTARY ALIMENTS.

These are important accessaries to our other aliments. I may here remark that none of the purely warm or aromatic condiments, or what may be properly called the noble species, do not grow in the district, such as cardamoms, cinnamon, nutmeg, &c. Of the pungent class, ginger and chillies may be mentioned as those locally grown and extensively in use. They require no further description. There are three chillies known in the district,—see catalogue of the fœtid condiments; a large number are raised in the district, and it will suffice if I simply enumerate them here and send a specimen of each kind. They are as follow :—

Kalajira (কাল জিরা।)—*Nigella sativa.*
Methi (মেথী।)—*Trigonella foenum græcum.*
Haldi or Halud (হলুদ।)—*Curcuma longa.*
Dhania (ধনিয়া)—*Coriandum sativum.*
Sowa (শোয়া।)—*Anethum sowa.*
Jwan (জোয়ান)—*Plychotis ajwan*
Radhuni (রাঁধুনী)—*Plychotis involucrata.*
Mouri (মৌরী)—*Pimpinella anisum.*

NATIVE COOKING AS PRACTISED GENERALLY IN BENGAL.

Names of dishes and mode of preparing them.

1. *Siddha* (সিদ্ধ)।

   To boil, boiling, or the products of boiling. A. siddha puli, siddha chal, &c.

2. (*Bhat ranna* ভাত রান্না).

   To boil rice, or boiling of rice. There is an art in doing this, if I may so express myself and it is only those who have often boiled rice who fully understand the process. The secrets of the process are—first, the proper regulation of the heat; second, the proportioning of the water required to boil (the usual proportion is about three bulks of water to one of rice if the grain is new, and four to one of rice if old); and third, the determination of the exact time when the operation is to cease. This is determined when there is no longer any central hardness in the boiling grain, or maz, as it is called.

Bhâte bhât (ভাতে ভাত).

This means boiling of some other article of food with rice in the same pot or vessel at the same time. This dish is a very convenient one, forming as it does a complete meal by itself, and is resorted to when the object is to dress food as quickly as possible. The rice is eaten without further preparation, but the other articles require to be seasoned with oil and salt.

Ghanta (ঘণ্ট।).

This is a dish in which, as the name implies, a great deal of stirring the dish with a stick (kati)—and stirring it round and round in the pot—is required while cooking. It is made generally of greens sliced and cut up in very small pieces with the addition of some common spices (turmeric, chillies, ground mustard, &c.), sometimes of few *boris*. Mustard-oil and salt are of course also added, as in the generality of native dishes. The best ghantas are those made of the *mocha* (inflorescence of plantains), *palang sag* (Beta bengalensis), and *katchu sag* (petioles of Arum calocassia).

Sarsari (শড়শড়ী।).

This consists in frying to a soft consistency any sag or tender part of vegetables in oil, and when sufficiently done, adding a few mustard seed in the hot oil in the pot to impart to the dish its peculiar empyreuma.

Bhajá (ভাজা।).

Frying in general. As a preliminary, the substance to be fried is rubbed over with a little ground turmeric and salt.

Pora (পোড়া).

Singeing and roasting over fire in general. Potatoes, brinjals, and many other roots, tubers, fruits, and nuts, are often thus prepared. Sometimes the substance to be roasted is previously enclosed in plantain and other leaves.

Dánlá (ডালনা।).

Danla is properly speaking a vegetable stew with the gravy rather thick, made usually of farinaceous, fleshy, and mucilaginous esculents. Rice-meal made into a paste, called pituli, is generally used to give the required consistency to the dish. More than one vegetable is required to make this dish, and ghee is often substituted for mustard-oil to give it increased flavour. The best *danlas* are those of potato, greens, peas, green jack fruit, and cauliflowers.

Charchari (চড়চড়ী).

May be described as a vegetable stew without any gravy. It is generally made pungent, and fish is sometimes added.

Chhenchki (ছেঁকী।).

Is more like a charchari, but usually a greater medley of the two. It is chiefly prepared with vegetables, and generally with fewer spices.

Dal (ডাল).

This constitutes a most essential part of the diet of a native. What is bread to meat and butter to bread in Europe, the same may be said of dal to a Bengali's rice. It is in other respects, as it were, his great standing dish, and without it his meal can be hardly considered complete. It consists of the detached cotyledons freed from husk of the bean, pea, and other pulses, boiled down with spices, chiefly turmeric, chillies, and black pepper, oil or ghee, and salt, to the consistence of pea soup, with this difference that the cotyledons are only partially dissolved. The quantity of water to be used for boiling is regulated according to the nature of the pulse and the consistency required. The word "dal" is also applied to the split seeds in the dry uncooked state. It is a highly nourishing dish, and, containing a large amount of azotized material, cannot but supply in a great measure any deficiency of that element in the rice, which constitutes the staff of life of the Bengali.

Chhanchra (ছেঁচড়).

This is a sort of hodge-podge prepared only on the occasion of a great feast or Juggi among the Hindus with the odds and ends of various vegetables and fish, such as the succulent stalks and soft peels of the former, and the liver, air-bladder, and gills of the latter, rendered hot with plenty of common spices. In consistence it is made more like a *ghanta*.

Khichri (খিচুড়ি).

This, like *bhate bhat*, is an extempore, but a very rich, dish. It is made by boiling rice and dal together with various spices, salt, and clarified butter. The dals that make best khichries are the *arhar*, *mug* and *musari* (মুগ ও মুশারী).

Jhol (ঝোল).

Is a stew-like preparation, with plenty of gravy in it. This is one of the most favourite dishes with the natives, and is either made with vegetables and fish, separately or both together. Usually the best vegetables, fish, and spices, are selected for jhol.

Súkta (সুক্তা).

Is a vegetable stew rendered bitter by the addition of some bitter herb, fruit, or leaves. The *nim*, the bitter jute leaves, and *palta*, are usually employed for this purpose.

Ambal (আম্বল).

This is simply an acid stew or jhol, according to consistency. The acid most commonly employed is either the tamarind or green mango, fresh or in the dried state. See Amsi, under Acid Food.

Paramanná or khir (পরমান্ন কি ক্ষীর).

Is a sort of frumenty prepared with rice boiled in milk and sweetened and aromatized with sugar, camphor, and cardamoms.

Ogra (ওগড়া).

Is a convalescent or sick diet prepared by boiling fine old rice and some light dal together like a *khichri*, with a few spices, in the proportion of one part of the former and four of the latter. Mug or masur are usually preferred. Sometimes khai is substituted for rice as a still lighter diet.

Juce.

A light broth made with vegetables or meat for the sick. Young fish is also used for the purpose. Sometimes a bitter is added to render the broth slightly tonic and stomachic at the same time.

Polao (পোলাও).

Polao is prepared by boiling rice in a decoction of meat, previously made, to which is added a quantity of solid meat and as much of onion, ginger, blackpepper, and other spices, such as cardamoms, cloves, &c., as would impart a rich flavour to the dish, and when the rice and meat have become somewhat tender, the whole is then properly baked on a slow charcoal fire with the addition of enough ghee as will give it a rich appearance

Kalia (কালিয়া).

This dish is dressed in various ways, which in fact depend more on the choice or means of the party than any regular process. Generally it is prepared like a curry. To make an ordinary *kalia*, the meat is at first cut up into small pieces, to which is added a quantity of curry ingredients, consisting of turmeric, ginger, chillies, garlic, and onion, well ground with as much water as will make each ingredient into a thick paste. These and the meat having been well mixed together with some salt, are put on the fire in a pan with some ghee or oil, previously heated, in the proportion of a chittack to a pound of meat, and the whole is then kept simmering on the fire, sprinkling occasionally the inner parts of the pan with water to prevent the ingredients from being burnt. This is continued till the meat is properly seasoned, and then a quantity of either vegetables and water, or only water, is added, but enough so as to make the meat tender and leave a quantity of gravy besides. Some prefer it without gravy, in which case the *kalia* is kept longer on the fire to dissipate all the water, when it is called *dopayaja* or *bhuni*.

Kurma (কুরমা).

Kurma is prepared by cutting up the meat into pieces of a quarter seer each, and having sprinkled it with some salt, is then boiled in a little water to soften it, with the addition of some ginger, garlic, and other spices, but no turmeric or chillies. When the water has nearly evaporated, a quantity of dahi or butter-milk is put in, and the whole is then fried in plenty of ghee until the meat receives a fine brown color. It is now put by for use. In this form it will keep for several days, specially in the cold weather.

Koptas (কোপ্তা).

Koptas are made by mincing meat very fine and then chopping it by means of a blunt chopper, so as to beat the meat almost into a paste, and then with the addition of some salt, pepper, and the juice of garlic, ginger, and onion, sliced, the whole is well kneaded and formed into balls, and afterwards fried brown in ghee.

Kati kabab (কাটিকবাব).

This is made by cutting up the meat, freed from bones, into small pieces, and after seasoning it for a certain time with some salt and the juice of onion, ginger, and garlic (a little turmeric is added sometimes), the pieces are strung into by thin sticks (katis) or spits made of bamboo from about 9 to 15 inches long, and roasted on a charcoal fire, bathing them occasionally with ghee and butter-milk.

SWEETMEATS, OR FESTIVE ALIMENTS.

Including cakes, pastries, and similar compounds.

They may be classified as follows:—

Class I.—Simple festive aliments, or those made of single components.

Order A.—Those made of starch or starchy bodies.

Species 1.—Rice starch:
Chalbhaja (চাল্‌ভাজা)
and its chhatú (ছাতু).
Muri (মুড়ি).
Khai and its chhatú (খই ও ছাতু).
Chira and its chhatú (চিঁড়ে ও ছাতু.)
Aske (আশকে).
Chilúí (চিলুই).
Chusí (চুশি).
Kaón chalbhaja and chhatú.

Species 2.—Wheaten starch:
Ruti, hand-made bread, sáyâí, native (শেওই).
Vermicelli or macaroni.

Species 3.—Barley starch:
Chattú (ছাতু).

Species 4.—Dál starch:
Chhôla bhaja (ছোলাভাজা).
,, chhattú (,, ছাতু).
Mater bhaja (মটরভাজা).
,, chhatú (,, ছাতু.
Sarúchákli (সরুচাকলী).

Order B.—Those made of gur or sugar.

Species—
Patali (পাটালি).
Poira (পয়র).
Chini or common sugar (চিনী).
Ola (ওলা).
Misri or crystalized sugar (মিসরী).
Batasa or clown sugar (বাতাশা).
Pheni-batasa or foamed sugar (ফেনী বাতাসা).
Mats (মট) or moulded sugar.
Birkhundi (বিরখণ্ডী) or pulled sugar.
Varieties of kadma (কদমা).
Kantal-kushi (কাঁটালকুশী).
Poinche (পইঁচ).
Elachi-dana (এলাচদানা) cardamom drops.

Order C.—Those made of cocoanut.
Neyapatti (নেয়াপাতী).
Narikel-kora (নারিকেলকোরা).
,, ful or flower.

Order D.—Preparations of milk.

Species—
Sár (সর).
Khír (ক্ষীর).
Khirsá (ক্ষীরশা).
Pat-khirsá (পাত ক্ষীরশা).
Chhánnâ (ছানা).
Dáhi (দধি).

Class II.—Compound festive aliments of binary combination.

Order A.—Those made of sugar and starch, or starchy bodies.

Species 1.—
Murkis (মুড়কী).
Chini-múrki (চিনি মুড়কী).
Common do.
Nakul (নকুল).

Species 2.—Moahs (মোয়া).
Moah of khai (খই).
,, muri (মুড়ি).
,, cheera (চিড়ে).
,, kaon (কাওন).
,, khai (খই).

Species 3.—*Chaktis* (চাকতি).
Chakti of muri (মুড়ির চাকতি).
,, chira (চিড়ের ,,).
,, chal-bhaja (চালভাজা).
,, matár (মটরের চাকতি).
,, chholá (ছোলা).
,, póst-dáná (পোস্তদানা).

Species 4.—Laddus (নাড়ু).
Laddus of matar (মটর নাড়ু).
,, mug (মুগ ,,).
,, khai (খই ,,).

Order B.—Sugar with cocoanut and other oily bodies.

Species—Chhyáni ([illegible])

Narikel narú (নারিকেল নাড়ু).
„ chira (চিড়ের „).
„ zira (জিরের „).
„ ful.
Raskara (রসকরা).
Reuri (রেওড়ী).
Til-birkhandi (তিল বিরখণ্ডী).
Matka (মটকা).
Til-narú (তিলনাড়ু).
Narikel-tackti (নারিকেল তক্তী).
„ barfi („ বরফী).
Ganga jal (গঙ্গা).

Order C.—Sugar with khir.

Species—

Khir chanchis (খীর ছাঁচ).
„ Tacktis („ তকতী).
„ Narús („ নাড়ু).
„ Pulis („ পুলি).
„ Barfis („ বরফী).
„ Sandeshes(„ সন্দেশ).

Order D.—Sugar with khir.

Species—

Sandesh or mandah.
Golla (গোল্লা).
Puli (পুলি).
Chanch (ছাঁচ).
Atta (আতা).
Golabjam (গোলাবজাম).
Mundi (মুণ্ডি).
Kanchagolla (কাঁচাগোল্লা).
Chhana-murki (ছানার মুড়কী).
Gúr-sandesh (গুড়ের সন্দেশ).

Order E.—Starch with ghee or oil.

Species—

Luchi (লুচি).
Puri (পুরি).
Pappor (পাপর).
Phuluri (ফুলারি).
Chanachur, &c. (চনাচুর).

Class III.—Compound festive aliments of ternary or quaternary combination.

Order A.—Sugar with rice starch and cocoanut.

Species—

Siddha puli (সিদ্ধ পুলি).
Bhaja puli of rice (ভাজা পুলি).
„ „ of chira (চিড়ের পুলি).
„ „ of sweet potato (আলুর পুলি).
„ „ of mug and rice (মুঙ্গ ও চাল).

Order B.—Wheaten or dal starch, ghee, and plenty of spices.

Species—

Kachuris (খিচুড়ি).
Dal puris (দাল পুরি).
Nimki (নীমকী).

Order C.—Sugar, channa, besam, or rice starch.

Species—

Chhanna bara (ছানাবড়া).
Panitua (পানিতোয়া .
Lalmohan, &c., (লালমোহন).

Order D.—Sugar, ghee, shár or khir.

Species—

Sharbhaja (সরভাজা).
Mattichur of khir (মোতীচুর).
Bondeyá, &c. (বন্দিয়া).

Order E.—Sugar, cocoanut, ghee, and starch.

Species—

Chandra kait (চন্দ্রকাইত).

Order F.—Sugar, wheaten starch, besam, and ghee.

Species—

Gajás (গজা).
Khajas (খাজা).
Jilepí (জেলাপী).
Amirti (অমরতী).
Matichur (মোতীচুর).
Packhánna (পাকান্ন).
Bundiyas (বুন্দিয়া).
Jhurís (ঝারি).
Mohanbhog (মোহন ভোগ).
Rashkará (রসকরা).

Order G.—Sugar or sweet pulpy fruits, starch and ghee or oil.

Species—

Malpuah.
Baras of kálá.
„ of tál, &c.

Order H.—Sugar, ghee, and pulp or flesh or certain fruits.

Species—

All morabbas or candied fruits.

Order I.—Milk, sugar, and starchy bodies.

Species—

Paramannás of rice.
„ of chira.
„ of sago.
„ of suji.
„ of chhana, &c.

Order J.—Rice meal, gur, cocoanut, flesh, til-seed, and mustard-oil.

Species—

Ananda naru (আনন্দ নাড়ু).

Sweetmeats, comprehending as they do a great many substances and their preparations, do not necessarily fall within the scope of the present report. They do not constitute the ordinary food of man; but still as they are more or less used by all classes of the people, and they have not so much as a common generic name to distinguish them properly from other articles of dietary, I propose to describe them under the more expressive appellation of festive aliments, as it is on occasions of festivity, pleasure, and merriment that they are so generally and extensively consumed. A detailed account of all the cakes, pastries, and sweetmeats, would occupy more space than we can devote to the subject at present. However, by the arrangement we have introduced, the whole subject will be brought under one view, and it will be easily seen what substances principally enter into their composition, the names by which they are known, how far they resemble each other, wherein any differences exist, and in fact every essential point which it may be necessary to learn regarding these bodies, will at once be brought before the eye. In the enumeration a few names may have been omitted, but that does not render the classification defective. I shall here glance over some of the most common preparations. It will be observed that the chief ingredients in native confectionery are sugar, rice, wheaten and dal starch—the last of which is called besam—ghee, and other preparations of milk and cocoanut. The cocoanut sweetmeats and pastries are all more or less indigestible, and the same may be said of other compounds in which ghee and oil enter largely as one of their components.

CLASS I.—SIMPLE FESTIVE ALIMENTS, OR THOSE MADE OF SINGLE COMPONENTS.

Order A.—*Those made of starch or starchy bodies*:

Species 1.—Most of these articles have already been described. Aske and chéttái are circular cakes prepared from a batter made of rice meal and water, and sometimes also with the addition of milk, and baked in a rude oven. Aske differs from chéttái more in size, one being larger than the other, and one resembling a concavo-convex, and the other a plano-convex lens. *Chusi* is a kind of macaroni made from rice paste, but in short lengths, hardly measuring an inch.

Species 2.—Aliments with wheaten starch.

The common *ruti* of this country is a species of unleavened bread, made from ordinary fresh dough, in form of circular plates or flat cakes, either between the hands by flapping (*chapeti*), or flattened out by a roller. *Dallian* (*dalli ruti*).—It is now baked on a pan and then, still hot, quickly placed over some live charcoal, when the sides point and the whole thing presently swells out into a bladder-like form. It soon again sinks into its former shape by cooling, when it is fit for use. The hand-bread is either eaten raw (*sukna ruti*), or rubbed over with ghee (*ghee-maka ruti*). When in the bladder form, it may be made crisp by keeping it a little longer and constantly rolling it over fire (*kurkura ruti*). The native vermicelli or macaroni is prepared very much in the same way as in Europe. Both the pipe and ribbon forms are known.

Species 3 & 4.—The various *bhajahs* and *chhattus* here named have been already noticed. *Chattus* are simply powdered *bhajas*. *Saruchakli* has been also described.

Order B.—Those made of gur or sugar :

The preparations under this order are sufficiently expressive without further description

Order C.—Those obtained from the cocoanut :

Neyapatti is the delicious soft semi-transparent kernel of the young cocoanut. *Narikel kora*, and *narikel* flowers, &c., have been previously mentioned.

Order D.—Preparations of milk :

See for description under Milk.

CLASS II.—FESTIVE ALIMENTS OF BINARY COMBINATION.

Order A.—Those made of sugar with starch or starchy bodies :

Species 1.—*Murkis* (মুড়কী).

These are simply any sort of *khai* mixed with sugar or *gur*. *Nakal* is parched gram enveloped in sugar.

Species 2.—*Moahs* (মোয়া).

These are compounds of *gur* with *khai*, *muri*, *chira*, *kaon*, &c., formed into balls of various sizes. Sometimes spices are added, and thus *moahs* of khaiechur (powder *chur*) are rendered highly flavoured. These last are known as *mukund moahs*.

Species 3.—*Chaktis* (চাকতী).

These are similarly prepared to moahs, and so called on account of being generally made on thick circular plates or wheels (*chakas*).

Species 4.—Certain laddus (নাড়ু).

These are not unlike *moahs*, but generally of smaller size and made more compact, the ingredients being previously beaten into a sort of pasty moss.

Order B.—Sugar with cocoanut with other oily bodies :

Chhayi is scrapings of cocoanut mixed with *gur*, or sometimes sugar.—*Narikel chira* is *chhayi* formed into balls.

Narikel chira, *jira*, *fuls*, are figures cut in imitation of *chura*, *jira*, and many flowers, from the ripened flesh of the cocoanut, and candied. *Rashkara* differs from *narikel naru* in the *chhayi* from which it is made being prepared with sugar; spices are often put in to flavour. *Reyori* consists of flattened bits of pulled sugar coated with some oily edible seeds, such as poppy seeds or those of sessamum orientale. *Birkhandi* is the same in thick round and square pieces. *Til narrus* are made with sugar and sessamum seeds. *Narikel tackti*, *barfi*, and *ganga-jali*, vary little from each other excepting in form.

Order C.—Sugar with khir :

The *khir chhanches* are merely preparations from a composition of *khir* and sugar, sometimes flavoured with camphor, cast on wooden, earthen, or stone moulds of various shapes and patterns. *Tacktis*, *narus*, and *pulis*, are respectively the plated, round, and spindle shaped forms of the above. In the *khir*, *burfis*, and *sandeshes*, a little chhanna is frequently mixed, and some granular sugarcandy besides, called *bukni*.

Order D.—Sugar with channa :

Sandeshes are of circular form, consisting of plano-convex pieces joined together by their flat surfaces. The name is also used as a generic term for preparations of sugar and *chhanna*. *Gollahs* are globular, pulis are spindle-shaped, *chhanches*, *sandeshes* made in moulds are *ata* (custard-apple-shaped), *golab jam* (rose-apple-like), &c. *Mundis* mean diminutive *gollahs*. *Katcha gollah* and *rasha gollah* consist of more *chhanna* than sugar. *Chhanna murkis* are little *khai*-like nodules of *chhanna* encased in sugar, and the *gur sandeshes* are simply *sandesh* made with gur of the date instead of common sugar. I may here state that cane gur is never made into a *sandesh*. The date *sandesh*, when prepared, retains the peculiar flavour of the fresh date gur.

Order E.—Starch with ghee or oil :

Luchi is unbaked ruti prepared from a dough made with a little ghee and then fried in the latter substance or oil. Puris are similarly made, but larger. Pappar is a thin ruti of bésam mixed with spices and fried crisp and friable in ghee. Phularies are prepared from a batter of bésam and fried in small round lumps in the same substance or oil. Channa chur is fried, chunna or gram beaten flat and mixed with ghee or oil, and often hot spices.

CLASS III.—COMPOUND FESTIVE ALIMENTS OF TERNARY AND QUATERNARY COMBINATIONS, AND SOMETIMES OF MORE SUBSTANCES.

Order A.—Sugar with rice, starch, and cocoanut :

Siddha pulis are simply pulis (spindle-like cakes) of rice-meal paste stuffed with chhayi, and boiled in water or milk. *Bhaja* pulis of rice, *chura*, *khai*, sweet potato, *mug dal*, &c., are the same made of rice, *chira*, &c., flattened in the middle and fried on a pan in oil.

Order B.—Wheaten and dal starch, ghee, and plenty of mussalahs :

Kachuris are prepared like rutis from a dough of wheaten flour with a thick stuffing of dal paste and spices mixed up together and fried in ghee, and occasionally oil. Dalpuris differ from the above in not requiring any stuffing, bésam being mixed with the dough. Nimkis are made with a dough of wheaten and dal meal, to which some salt is added and then fried.

Order C.—Sugar, channa, ghee, and rice or dal starch :

Chhanna bara is easily prepared from a dough of chhanna and rice starch (latter is known as safeda) or sometimes dal starch, (bésam) in shape of balls varying from a hen's to duck's eggs, and these are then fried in ghee, and while still warm and porous, steeped and kept in syrup. *Panituas* and *lal mohuns* are nearly different sizes and shapes of the above.

Order D.—Sugar, ghee, shar, and khir :

Shar bhaja requires no explanation. *Matichur* and *bundeyas* of *khir* are simply sweetened *khir* made in the manner of those methyes or sweetmeats.

Order E.—Sugar, cocoanut, ghee, and starch :

Chandar kait.—This is a preparation of sugar, cocoanut, and starch, fried in ghee.

Order F.—Sugar, wheaten starch, besam, and ghee :

Several kinds of gajahs are met with. Some are thick cubes from half an inch to an inch long, some finger-shaped, some little lozenges, and some tongue-shaped. They are made from a dough of wheaten and dall starch or rice starch, shaped in forms as above, and fried brittle in ghee and then steeped in thick syrup, so as to give a thin coating of sugar over them when cooled. The *khajahs* differ from *gajahs* in shape of making, and in the material used being of a finer quality. A *khajah* when prepared somewhat resembles an elephant's molar tooth both in outward form and internal structure, consisting of vertical plates, which are arranged something in the same manner as the dentine in the elephant's grinder. They are cemented and thickly coated over with a hardened crust of syrup. *Jilapies* are made from a thin batter of wheatened starch with a little rice starch (safeda) and water; the mixture is then poured in boiling ghee in coils in a circular form from a flat-bottomed funnel, and when sufficiently fried, dipped and preserved in syrup. They resemble in miniature the flat-chambered shell of a nautilus. Amartis are allied to the above, but made from a batter of maskalai meal. *Matichur, packhan, bundeyas,* and *jhuris,* are similar in composition, prepared from a batter of besam and saffeda fried in ghee in shape of beads, the batter being passed through a colander with small or large holes as the case may be; the beads are afterwards saturated in thick syrup. When the beads are made into balls, they form either *matichur* or *packhan,* according as the beads are small and fine or coarse and large. In their separate state they are either jhuris or badiyas, the latter being the larger of the two. Mohanbhog or halua consists of fine wheaten flour (suji), ghee, milk, sugar, spices, almonds, and raisins, all mixed up together and boiled to the consistence of a paste. Rash baras are made with mascalai meal in form of balls and fried like *phularis* in ghee, but of a more spongy texture, and then steeped in syrup.

Order G.—Sugar or sweet pulpy fruits, starch and ghee or oil.

Malpoah is thus made:—Rice or wheaten starch, pulp of the plantain, and mascalai meal, all beaten up together into a batter and fried in cakes in ghee or oil and then soaked in syrup. *Baras* are round balls made in the same way, generally from a batter of some sweet pulpy fruit, as plaintain, tâl, and a meal, either rice or wheaten.

Order H.—Sugar, ghee, pulp or flesh or certain fruits.

Morabbas or sweet preserve.—These are made pretty much in the same way as those in Europe. The best in the district are those of bel and mango.

Order I.—Milk, sugar, and some starchy substance.

Paramanna (পরমান্ন).—The rice paramanna has been already described, others are similarly made.

Order J.—Rice-meal, gur, cocoanut, flesh, tilseeds, and mustard-oil.

Ananda Naru (আনন্দ নাড়ু).—This is made in form of balls from a paste compounded of the first four substances and then fried in mustard-oil. Ananda naru means the sweetmeats with which most Hindu families celebrate their marriages and the ceremony of ear-boring, *karna veda,* equivalent to that of circumcision among the Jews and Mahomedans.

XV. No reliable information is available as to the supply of salt and the amount of consumption per head of population; but judging from the consumption in my own house, I should say about a quarter of is a chittack is consumed daily per head with wastage, or say five seers per year. At which rate, the population of the district being 1,012,000, the quantity annually required for the entire district would be 126,500 maunds. The salt consumed is the sea-salt, chiefly imported from Calcutta.

DRINKS.

XVI. No tari is made in the district. Mahua is unknown, and the spirits generally consumed are either English, or rather Calcutta, rum bottled and sold as brandies, or the arrack distilled in the Government distilleries—the former by the better classes in the towns, and the latter principally among the lower orders of Hindus, such as baruahs, chamars, sweepers, prostitutes, &c.

XVII. Tea and coffee are not cultivated.

XVIII. See description of the principal sherbats and beverages under Food. A specimen of country vinegar is shown.

SMOKING.

XIX. *Tobacco.*—Tobacco is only sparingly grown in small patches round houses by the ryots, but the leaf, although well formed and the outturn pretty fair as regards quantity, is very weak, owing probably to the too humid character of the soil and climate; and this is perhaps why the cultivation is not carried on on a large scale. The little tobacco raised is never brought to market, being principally kept for home consumption by mixing it with the superior imported sorts. The mode of cultivation is not different from that followed elsewhere. There is only one form in which the weed is used for smoking, viz. that commonly known as *guruk tamac*, or cake tobacco, prepared by mincing the dried leaves, previously chopped fine with a *dâo*, or reduced to powder in an *ukli* (wooden pestle and mortar), with *gur*, and then kneading the whole well with the hand into a hard paste. A few massalahs are sometimes added to give it an agreeable scent. A small cake of the chopped sort of the prepared tobacco will be found among the specimens. The other kinds are similar to those met with in Calcutta. Cheroots are not made in the district. The apparatus for smoking is the same as elsewhere. A little tobacco leaf is sometimes chewed by old women with *pân*, and a little is also consumed as snuff, but not much.

XX. *Siddhi, charas,* and *ganja :*

The drug *Canabis indica* is used in only two forms in the district, viz. either as *bhang* or *siddhi*, consisting of the dried upper leaves and the loose panicles without the stalks, which the natives collect during the rains while the plant is in flower, it growing quite wild in waste places in the villages; or as ganja, its dried clustered raceme, which is always imported and sold under Government license. Of these, ganja is alone smoked for intoxicating purposes, the other being almost always, I believe, employed only medicinally.

Charas and opium-smoking have, as far as I know, few votaries, if any, in the district.

XVIII.—Pân or betel.—Pân (পান), *Piper betel.*

Cultivated in a sort of green house, known as a *pân boroz*, at intervals of a few miles all over the district. Frequently several of these houses occur together. Besides shading from too much sun, the plant requires other careful nurture, which the baruis, the caste who cultivate the *pân*, alone understand how to bestow upon it. The soil of an elevated spot is essential, and it must be well drained and kept always well manured, the best manure for the purpose being old *khali* (mustard-oil cake). The pân produced in the district is of the common kind—no *chhâchi pân* being, as far as I know, here grown; although to meet the Dacca market, quantities of this variety of leaf are, I hear, raised on just the other side of the Pudma, in the Dacca district. The leaf is universally chewed, daubed at first with a little quick-lime, and then placing over this a few slices of the areca nut and a small fragment of *kuth* or *khayèr*; the whole is afterwards folded into a flattish cone or packet with the leaf outside—*pân khili*, a clove being often pierced through the upper open end of the cone as a pin to prevent the ingredients from falling out. The lime and *kuth* when chewed together gives a deep orange or red colour to the cud, and thus dyes the lips and tongue in the peculiar manner so common among the natives of this country. The pân thus eaten, generally after a meal, serves as a powerful digestive stimulant to the stomach, while, owing to the lime it contains, it prevents any undue acidity. I believe the chewing of the betel in the mouth has also something to do to preserve the teeth, which its votaries generally keep so well.

COOKING UTENSILS.

The subjoined list contains all the utensils ordinarily used for culinary purposes in the district. They are either of course baked earthenware, or stoneware, or made of metal, iron, copper, brass, or kasa, a kind of bell-metal.

I.—Earthen Utensils.

1. *Tolo* (তউলো), *boiling pot.*

This is the largest pot used in native cooking, of an oval form, and very much shaped like an ordinary jar, with the parieties however made rather thin. The mouth of this vessel is always about two-thirds its largest width at the middle. An ordinary *tolo* will hold about 20lb of cooked food. Half and quarter sizes are made for convenience of different families, and they are used for boiling water, boiling rice, and cooking dal, &c. Large tolos are sold at one anna a piece.

2. *Tijel* (তিজেল).

This is a flattish vessel, with the mouth almost as wide as at its middle. A *tijel* is generally better baked than a *tolo*. It is used for preparing almost all native dishes, excepting boiling rice. Ordinary price of a tijel is about 6 pie.

3. *Malsa* (মালশা).

This resembles in shape and size a large bowl or cup without a foot-piece or a ring below to stand on. Used principally as a receiver. Price, pice a piece. When of smaller size it is called a malsi.

4. *Sara* (সরা).

This is a concavo-convex plate of earthenware, chiefly serving as covers to vessels. The *saras* in this part of the country mostly have a handle at the foot. Price, two for a pice.

5. *Kálás, ghará,* (কলস, ঘড়া).—*Water-pots.*

Too well known to require description. Price, two to four pice, or an anna a piece, according to size.

6. *Khuri.*

This is a saucer-shaped ware, but with everted edges. They are employed to serve out dishes separately to each guest at a feast. Price, four for a pice.

7. *Katorá* (কটোরা).

These are fashioned exactly like saucers, and used similarly as *khuris*. Price, two for the pice.

8. *Pite sara* (পিটে সরা).

This consists of a *sara* with a handled *katora* inverted over it, a contrivance for baking aske, a kind of rice cake. Price, half to one anna each.

II.—UTENSILS OF STONEWARE USED FOR COOKING PURPOSES.

1. *Sil* and *Nora* (শীল ও নোড়া).

Slab and muller.—No description required. The usual price is 8 annas for a set.

2. *Pathr bati* (পাথর বাটী).

Stone cups, used for keeping and serving out acid dishes. Price varies according to kind of stone and make.

3. *Khora* (খোরা).

This is a large cup with a flat base, chiefly employed as a receiver for acid things. Price varies as above.

III.—METAL UTENSILS.

1. *Beri* (বেড়ী).

A pair of iron or brass tongs, used to take a cooking pot from the fire. Price, about two annas a pair.

2. *Hata* (হাতা).

A ladle made of iron or brass. Price, about an anna each.

3. *Khunti* (খুন্তী).

Is a ladle with a square or oblong flat blade, used to prevent anything sticking to a frying pan when frying. Price, about an anna each.

4. *Karai* (কড়াই).

Is a deep round metal pan, generally of iron, used for frying, stewing, and other similar dishes, and also for boiling milk and sometimes rice. Price, 8 annas to Rs. 1-4 each.

5. *Baguna* (বগুনা).

Is a vessel made of brass in shape of a *tolo* and used similarly. Sold according to weight for Re. 1 to Rs. 1-4 a seer.

6. *Dekchi* (ডেকচী).

Is a copper boiler, shaped and used like the above, and also employed for cooking in general. Price as above.

7. *Tawa* (তাওয়া).

Is a thin flat iron pan without any border, used for frying in general, and baking *chapeti* or hand-made bread. Price, anna to two annas a piece.

8. *Batis* (বাটি).

These are metalic cups, of all shapes and sizes, used in native cookery, either as receiver of substances in the cooked or uncooked state, or for serving out dishes on the table after they are dressed. Sold by weight as baguna from Re. 1 to Rs. 1-4 per seer. As most of these utensils are common to every part of the country, only a few selected specimens will be sent—more to show how badly they are made in the district, than possessing any special local peculiarity or interest.

Prices Current of Food-grains and Salt in the undermentioned Districts of Bengal on the 15th February 1873.

DIVISION.		DISTRICTS.	QUANTITIES PER RUPEE BY THE SEER OF 80 TOLAHS.																								REMARKS.
			WHEAT.			BARLEY.			RICE, BEST SORT.			RICE, COMMON.			BAJRA.			JOWAR.			GRAM.			SALT.			
			Present return.	Next preceding return.	Corresponding return of last year.	Present return.	Next preceding return.	Corresponding return of last year.	Present return.	Next preceding return.	Corresponding return of last year.	Present return.	Next preceding return.	Corresponding return of last year.	Present return.	Next preceding return.	Corresponding return of last year.	Present return.	Next preceding return.	Corresponding return of last year.	Present return.	Next preceding return.	Corresponding return of last year.	Present return.	Next preceding return.	Corresponding return of last year.	
		BENGAL.	S. Ch.	S. Ch.	S. Ch.	S. Ch.	S. Ch.	S. Ch.	S. Ch.	S. Ch.	S. Ch.	S. Ch.	S. Ch.	S. Ch.	S. Ch.	S. Ch.	S. Ch.	S. Ch.	S. Ch.	S. Ch.	S. Ch.	S. Ch.	S. Ch.	S. Ch.	S. Ch.	S. Ch.	
		Western Districts.																									
BURDWAN	1	Burdwan	10 0	11 8	15 12	22 0	22 0	28 0	18 0	19 8	26 0	22 8	22 8	28 0	...	...	...	...	...	...	22 0	22 0	20 8	9 4	9 8	9 4	
	2	Bancoorah	12 8	13 8	17 12	18 0	18 12	...	17 8	17 8	20 8	20 0	19 0	28 12	28 0	30	...	35 0	37 8	32 8	20 0	19 0	20 12	8 8	8 8	8 12	
	3	Beerbhoom	12 0	13 0	17 0	17 0	17 0	...	18 0	19 0	24 0	24 0	24 0	29 0	...	...	...	36 0	...	...	22 8	22 8	23 8	8 8	8 8	8 8	
	4	Midnapore	8 0	10 8	16 0	...	...	...	21 0	22 0	25 0	24 0	26 0	27 0	...	...	...	...	...	...	18 0	17 8	18 0	8 8	8 12	8 8	
	5	Hooghly	10 8	12 8	13 0	...	...	...	12 0	12 8	15 0	16 0	18 0	15 0	...	...	...	...	...	...	20 0	20 0	21 0	9 0	9 0	9 8	
		Howrah	12 0	14 0	15 0	20 0	20 0	...	17 8	16 8	13 0	22 0	20 0	19 0	...	...	...	...	...	...	22 0	20 0	...	9 8	9 0	9 0	
		Central Districts.																									
PRESIDENCY	6	24-Pergunnahs	10 0	12 1	16 0	20 0	20 0	22 3	8 0	8 0		8 3	17 0	22 3	...	...	...	...	...	...	18 3	17 2	20 0	8 3	8 3	8 3	
	7	Nuddea	11 14	13 5½	16 0	32 [illegible]	32 0	35 0	16 0	16 0	16 0	20 0	20 0	20 0	...	...	...	...	...	...	26 11	24 10	26 11	8 14	8 14	8 10	
	8	Jessore	12 0	12 0	13 8	...	...	...	20 0	20 0	20 0	29 0	29 0	29 0	...	...	...	...	...	...	20 0	20 0	21 0	8 0	8 0	8 0	
RAJSHAHYE	9	Moorshedabad	10 0	15 0	20 0	...	...	...	18 0	14 0	18 0	22 0	22 0	25 0	...	...	...	...	...	...	27 0	27 0	...	8 12	8 12	8 8	
	10	Dinagepore	11 5	12 0	12 0	22 5	22 5	25 0	24 0	23 0	24 0	28 0	28 0	32 0	...	...	...	...	...	...	16 0	17 0	24 0	7 5	7 5	8 0	
	11	Maldah	13 0	14 0	19 0	35 0	35 0	38 0	23 0	22 0	23 0	24 0	23 0	24 0	...	...	...	...	...	...	20 0	20 0	20 0	8 0	8 0	8 0	
	12	Rajshahye	12 12	13 8	15 0	...	...	...	16 14	18 12	18 12	25 5	24 0	27 3	...	...	...	...	...	...	25 5	26 4	...	8 2¼	8 2¼	...	
	13	Rungpore	14 0	15 0	16 0	...	...	...	16 5	16 5	15 0	30 0	30 0	25 14	...	...	...	...	...	...	14 0	12 10	19 0	7 4	7 6	7 8	
	14	Bograh	10 8	12 0	17 0	...	...	...	19 0	20 0	20 0	34 0	37 0	35 0	...	...	...	...	...	...	14 0	16 0	18 0	8 0	8 0	7 12	
	15	Pubna	12 0	14 0	24 0	...	...	...	11 0	12 0	15 0	30 0	30 0	30 0	...	...	...	...	...	...	24 0	26 4	30 0	8 4	8 4	8 4	
COOCH BEHAR	16	Darjeeling	6 0	6 0	8 0	10 0	10 0	10 0	12 0	13 0	13 0	16 0	16 0	13 0	...	...	...	...	...	...	8 0	8 0	8 0	4 8	4 8	4 8	
	17	Julpigoree	10 0	10 0	11 0	...	...	...	20 0	18 0	10 0	24 0	22 0	13 0	...	...	...	...	...	...	15 0	16 0	...	6 0	6 0	6 0	
		Cooch Behar.*																									
		Eastern Districts.																									
DACCA	18	Dacca	[illegible] 0	12 0	15 0	40 0	40 0	30 0	21 0	21 0	24 0	32 0	32 0	30 0	...	...	...	...	...	...	22 0	21 0	18 0	9 0	9 0	8 0	
	19	Furreedpore	[illegible]	20 0	29 0	...	...	...	10 0	10 0	12 0	27 0	27 0	26 0	...	...	...	...	...	...	24 0	25 0	...	8 0	8 0	8 0	
	20	Backergunge	[illegible]	...	...	...	...	...	13 0	18 [illegible]	[illegible]	31 0	29 0	23 0	...	...	...	...	...	...	...	...	...	8 8	8 8	8 0	
	21	Mymensing	[illegible]	11 0	20 0	...	...	...	22 8	22 [illegible]	[illegible]	32 0	32 0	33 0	...	...	...	...	...	...	19 0	19 0	18 0	8 12	8 12	8 8	
	22	Sylhet	[illegible]	11 0	13 0	11 8	...	12 0	25 0	24 [illegible]	[illegible]	35 0	35 0	35 0	...	...	...	...	...	...	2[illegible] 0	16 0	17 0	8 0	8 0	9 0	
	23	Cachar	[illegible]	9 2	13 5	...	...	...	27 14	26 10	[illegible]	32 0	30 8	32 0	...	...	...	...	...	...	15 4	15 4	16 0	8 3	8 6	8 14	
CHITTAGONG	24	Chittagong	10 0	12 0	13 0	...	...	...	17 0	18 0	[illegible]	25 0	26 0	27 0	...	...	...	...	...	...	17 0	17 0	17 0	9 0	9 0	8 0	
	25	Noakhally	...	...	...	...	...	...	18 0	18 0	[illegible]	27 0	27 0	25 0	...	...	...	...	...	...	16 0	16 0	12 0	8 0	8 0	8 0	
	26	Tipperah	10 0	10 0	14 0	...	...	...	20 0	20 0	20 [illegible]	32 8	32 8	37 8	...	...	...	...	...	...	18 0	18 0	18 0	8 12	8 12	9 4	
	27	Chittagong Hill Tracts	...	...	...	...	...	...	14 10	14 10	14 1[illegible]	16 0	16 0	16 0	...	...	...	...	...	...	...	...	...	8 0	8 0	7 0	
		Hill Tipperah	10 6	11 4	...	...	...	...	24 6	24 6	...	35 5	40 0	...	...	...	...	...	...	...	10 6	10 6	...	8 0	8 0	...	
		BEHAR.																									
PATNA	28	Patna	13 0	16 0	23 13	30 0	35 0	31 8	22 4	21 8	...	23 4	24 0	21 10	29 0	...	...	35 8	35 8	34 10	34 4	33 0	28 12	8 0	8 0	8 0	
	29	Gya	12 8	13 0	20 0	35 0	36 0	37 8	12 0	11 8	14 0	19 0	18 0	20 0	...	...	...	...	...	...	26 0	27 0	23 8	7 8	7 8	7 0	
	30	Shahabad	13 0	14 0	21 0	30 0	30 0	28 0	12 0	12 0	13 0	19 0	19 0	20 0	...	...	...	29 0	29 0	...	30 0	30 0	24 0	8 8	8 8	8 8	
	31	Tirhoot	13 0	14 0	19 0	25 0	25 0	24 0	20 0	21 0	20 0	22 0	22 0	22 0	...	...	...	...	...	...	25 8	24 8	24 0	7 12	8 0	8 0	
	32	Sarun	12 8	13 8	19 0	30 0	28 0	24 8	14 0	15 0	16 0	22 0	22 0	19 0	...	...	...	33 0	32 0	25 0	28 8	27 8	25 0	8 0	8 0	8 0	
	33	Chumparun	14 0	14 0	23 0	28 0	28 0	30 0	13 0	13 0	11 0	27 0	27 0	26 0	...	...	...	...	...	...	24 0	24 0	22 0	7 4	7 4	7 0	
BHAUGULPORE	34	Monghyr	14 7	16 8	21 8	37 8	36 7	...	12 6	13 6	14 7	21 9	18 9	22 0	...	...	...	33 6	34 6	25 2	33 6	33 6	...	8 4	8 4	8 1	
	35	Bhaugulpore	12 10	13 14	18 15	20 3	22 11	30 5	17 11	17 11	23 10	22 11	22 11	27 12	...	...	...	34 1	35 5	32 13	29 0	27 12	27 12	8 3	8 3	8 3	
	36	Purneah	12 6	11 0	20 0	30 0	40 0	40 0	25 0	25 0	25 0	27 0	28 0	31 0	...	...	...	...	...	...	25 0	26 0	30 0	7 5	8 0	7 5	
	37	Sonthal Pergunnahs	14 0	14 0	13 0	...	...	...	16 0	16 0	23 0	23 0	24 0	30 0	30 0	30 0	40 0	40 0	55 0	40 0	18 0	20 0	16 0	8 0	8 0	8 0	
		ORISSA.																									
ORISSA	38	Cuttack	15 1	13 2	18 0	...	...	...	24 0	26 4	17 1	30 3	31 8	32 0	...	...	...	...	...	...	30 3	23 14	31 0	8 8	8 8	9 0	
	39	Pooree	13 2	15 12	10 8	...	...	...	27 9	24 15	24 5	34 2	29 11	27 9	...	...	...	...	...	...	23 10	23 10	18 6	9 14	9 14	8 8	
	40	Balasore	12 0	12 0	...	...	...	...	16 0	16 0		38 0	32 0	...	...	...	...	...	...	...	10 0	10 0	...	8 0	9 0	...	
		CHOTA NAGPORE.																									
		South-West Frontier Agency.																									
CHOTA NAGPORE	41	Hazareebaugh	12 6	12 8	22 0	19 5	23 0	30 0	12 0	11 0	12 0	18 0	17 0	25 0	...	...	...	...	...	...	21 4	21 8	20 0	7 6	7 8	7 0	
	42	Lohardugga	10 0	10 0	14 0	20 0	18 0	...	16 0	16 0	22 0	18 0	20 0	25 0	...	...	...	...	...	...	16 0	16 0	...	6 5	6 5	6 0	
	43	Singbhoom	14 0	14 0	20 0	22 0	22 0	...	24 0	24 0	32 0	30 0	30 0	40 0	...	...	...	...	...	...	20 0	16 0	20 0	6 8	6 8	6 8	
	44	Maunbhoom	11 8	11 0	15 0	24 0	24 0	24 0	20 0	24 0	20 0	24 0	26 0	28 0	...	...	...	40 0	45 0	40 0	20 0	18 0	18 0	8 0	7 8	8 8	
		ASSAM AND ADJACENT HILLS.																									
ASSAM	45	Gowalpara	10 0	16 0	31 0	...	...	...	16 0	16 0	13 0	27 0	25 0	15 0	...	...	...	...	...	40 0	15 0	16 0	...	8 0	8 0	8 4	
	46	Kamroop	13 0	13 0	20 0	...	...	...	16 0	16 0	10 0	25 0	25 0	26 0	...	...	...	...	...	...	14 0	14 0	9 0	8 0	8 0	8 0	
	47	Durrung	10 0	10 0	10 0	...	...	...	13 0	13 0	8 0	21 0	21 0	20 0	...	...	...	...	...	...	8 0	8 0	9 0	6 8	6 8	7 0	
	48	Nowgong	16 0	16 0	16 0	...	...	...	12 0	12 0	13 0	21 0	20 0	18 0	...	...	...	...	...	...	8 0	8 0	10 0	6 8	6 8	7 0	
	49	Seebsaugor	13 0	13 0	13 0	16 0	16 0	16 0	10 0	12 0	16 0	14 0	16 0	24 0	...	...	...	...	...	...	8 0	8 0	8 0	6 0	6 0	6 0	
	50	Lukhimpore	10 0	10 0	10 0	...	...	...	7 0	7 0	7 0	13 0	13 0	14 0	...	...	...	...	...	...	9 0	9 0	8 0	6 0	6 0	6 0	
	51	Naga Hills.*																									
	52	Khasi and Jynteah Hills	...	...	...	...	...	...	14 0	14 0	...	16 0	16 0	...	...	...	...	...	...	...	8 0	8 0	...	5 0	5 0	...	
	53	Garo Hills.*																									

Rainfall, Weather, and State and Prospects of the Crops.

Statement showing Rainfall, Weather, State and Prospects of the Crops in the different Districts of Bengal, as reported to Government during the week ending the 22nd February 1873.

	No.	District.	Date of return from each district.	Rainfall at Sudder Station in inches.	Character of the weather in the district as far as known.	State and prospects of the crops at date.	REMARKS.
	BENGAL.						
		Western Districts.	1873.				
BURDWAN DIVN.	1	Burdwan ...	Feb. 25th*	Nil.	Weather getting hot...	Winter crops being reaped. Grain market same as before. Rain wanted for spring crops.	Fever decreasing.
	2	Bancoorah ..	" 22nd	Nil.	Much warmer than in the preceding week, and cloudy during the latter part.	Barley and wheat are doing well, as also other rubee crops. Sugarcane is still being cut.	
	3	Beerbhoom ...	" 22nd	Nil.	The temperature has risen. There are some symptoms of rain.	Crops doing fairly.	
	4	Midnapore ...	" 22nd	Nil.	Cold at Contai. In sudder station hot and close. A few drops of rain on the evening of the 1st.	No change since last week.	
	5	Hooghly ...	" 22nd	Nil.	Clear and foggy two mornings; cool till middle of the week, and after that suddenly became hot.	Winter crops good. Nearly gathered.	
		Howrah ...	" 22nd	Nil.	Clear, no rain ...	There is now no paddy in the fields. The sugar-cane crop, which is being cut, is a good one.	
		Central Districts.					
PRESIDENCY DIVN.	6	24-Pergunnahs ...	" 25th	Nil.	Sensibly warmer since last report. Foggy and cloudy at times.	Pulses gathered and no crops standing except khesari and chillies in parts of the district. Rain wanted for ploughing.	General health good. Sporadic cases of cholera reported in the Barripore and Diamond Harbour sub-divisions.
	7	Nuddea ..	" 22nd	Nil.	Becoming much warmer.	In general the crops are fairly promising. They would have been better with rain. In some places linseed and mustard have been much injured by insects. Gram has also suffered.	
	8	Jessore ...	" 22nd	Nil.	Clear and warm ...	Good.	
RAJSHAHYE DIVISION.	9	Moorshedabad ...	" 22nd	0·01	Clear and seasonable weather, but getting hot.	The prospects of the crops are on the whole promising, but want of rain is somewhat felt.	
	10	Dinagepore ..	...	...	......	......	Return not received.
	11	Maldah ...	" 22nd	Nil.	Warm and dry throughout; the first three days fair, the last four cloudy. Heavy clouds and thunder on the night of the 21st.	Wheat, barley, and other crops of the season promise an outturn of 14 annas. Boro dhan is in a thriving state. A little rain is wished for.	
	12	Rajshahye ...	" 22nd	Nil.	Cloudy evenings following hot days. Mornings cool.	The rubee crops are beginning to suffer for want of rain. Mulberry lands also require rain. The reaping of the mustard crops has begun.	

* Telegram of the 25th February received on the same day.

	No.	District.	Date of return from each district.	Rainfall at Sudder Station in inches.	Character of the weather in the district as far as known.	State and prospects of the crops at date.	REMARKS.
BENGAL.—(*Contd.*)							
		Central Districts.—(Contd.)	1873.				
RAJSHAHYE DIVN.	13	Rungpore ..	Feb. 22nd	·21	Slightly foggy ..	Good.	
	14	Bograh ...	„ 22nd	0·12	Has been fair and delightful throughout. There was a slight fall of rain on the night of the 21st.	The prospects of the winter crops continue fair.	
	15	Pubna ..	„ 22nd	0·03	Rather cloudy and warm, with rain threatening at close of week. On the night of the 21st there was a little rain, but not enough to do any good.	Some of the winter crops are ready to be cut. Rain is wanted for the other crops.	
COOCH BEHAR DIVN.	16	Darjeeling ...	...	...	......	......	Return not received.
	17	Julpigoree ..	„ 22nd	Nil.	Fair. Cloudy and promising rain the last two days.	Tobacco crop promising.	
		Cooch Behar ...	„ 22nd	Nil.	Cloudy since middle of week.	Same as last week. A few showers of rain wanted.	
		Eastern Districts.					
DACCA DIVISION.	18	Dacca ...	...	...	......	......	Return not received.
	19	Furreedpore ...	„ 22nd	Nil.	Weather slightly cloudy.	It is expected that rain will do good to rubee crops.	
	20	Backergunge ...	„ 22nd	Nil.	Getting warmer ...	Very good.	
	21	Mymensing ...	„ 22nd	Nil.	Weather warm and cloudy—looks like rain. A few drops of rain fell on the night of the 21st instant.	Land is being prepared for early rice cultivation. Rain would be beneficial.	
	22	Sylhet ...	„ 15th	Nil.	Hottish in the day time, cool in the mornings.	The state of the boro crop is promising.	
	23	Cachar ...	„ 15th	Nil.	Fair; somewhat colder than last week.	No crops on the ground.	
CHITTAGONG DIVN.	24	Chittagong ...	„ 15th	Nil.	Fine and seasonable; wind generally from the north.	Reports favorable. Nothing new.	Cholera still decreasing.
	25	Noakhally ...	„ 15th	Nil.	Morning and evening cool and pleasant; hot sun during the day with high north wind. Atmosphere drier than before.	Cold weather crops good. A shower of rain is much needed.	
	26	Tipperah ...	„ 22nd	Nil.	Heat increasing fast; the weather seems to threaten rain.	Mustard has been mostly gathered, and has yielded an average crop. The other small crops on the ground continue to thrive.	
	27	Chittagong Hill Tracts	„ 15th	Nil.	Cold at night and early morning, and warm during the day time.	The gathering of the mustard is nearly over.	
		Hill Tipperah ...	„ 15th	Nil.	Dry, clear, and cold ...	No change. Chillies doing well.	

No.	District.	Date of return from each district.	Rainfall at Sudder Station in inches.	Character of the weather in the district as far as known.	State and prospects of the crops at date.	REMARKS.
BEHAR		1873.				
PATNA DIVISION.						
28	Patna ...	Feb. 25th*	Nil.	Weather fine, the sky having cleared up.	Spring crops and poppy doing well. The reaping of mustard, mussoor, peas, &c., going on satisfactorily.	Health of the district good.
29	Gya ..	„ 22nd	A few drops.	Fine ...	Opium good; other crops also favorable. Rain somewhat wanted in the north of the district. Reports from Aurungabad and Nowadah sub-divisions not received.	
30	Shahabad ...	„ 22nd	Nil.	Weather warmer and cloudy. West wind during the week.	The rubee harvest is going on, and there has been no blight.	
31	Tirhoot ...	„ 22nd	Nil.	Fair ...	The rubee crops continue well. Barley and oats are in ear. West winds are not favorable to the indigo prospects. Rain is wanted in some places.	
32	Sarun ..	„ 22nd	Nil.	Weather fair, and is getting warm.	Crops are generally doing well. Mustard and peas are being harvested. The poppy crop is in flower. Indigo is being put in the ground.	
33	Chumparun ...	„ 22nd	Nil.	Cloudy during greater part of the week. Fair on the 22nd. Weather getting warm.	The prospects of the rubee continue fair, but want of rain in the end of the year 1872 had bad effect on the crops. It is said that the outturn may be expected at more than half and below three-fourths of the average outturn of favorable years. Peas are being harvested here and there, and the outturn confirms the above expectation. The mustard has been also less than the ordinary average.	
BHAUGULPORE DIVN.						
34	Monghyr ..	„ 22nd	0·02	Growing warm, sky cloudy, but rain holding off.	Crops are ripening fast. Sorsa already being cut, and prospects as good as ever.	
35	Bhaugulpore ...	„ 25th	Nil.	......	Reports differ, but for most part rain is required.	
36	Purneah ...	„ 22nd	Nil.	Much warmer ...	A good deal of the tori has been gathered. The rubee crops are promising, but they would be better for a little rain.	
37	Sonthal Pergunnahs...	„ 22nd	Nil.	Weather getting warmer; cloudy during greater part of the week.	No alteration since last return.	
ORISSA.						
ORISSA DIVN.						
38	Cuttack ...	„ 25th*	Nil	Temperature variable.	Crops good.	
39	Pooree ...	„ 15th	Nil.	Wind variable; sky clear as a rule.	Moog coming on well. Nothing new to remark.	
40	Balasore ..	„ 22nd	Nil.	Fine, but getting hot	No crops on the ground ...	Cholera is becoming prevalent.
CHOTA NAGPORE.						
	South-West Frontier Agency.					
41	Hazareebaugh ...	„ 22nd	Nil.	Variable, some days cloudly and close, others clear and cool.	No change since last week, wheat, barley, and gram, being cut and gathered.	

* Telegram of the 25th February received on the same day.

No.	District.	Date of return from each district.	Rainfall at Sudder Station in inches.	Character of the weather in the district as far as known.	State and prospects of the crops at date.	REMARKS.
CHOTA NAGPORE.—(*Contd.*)						
	South-West Frontier Agency.—(*Contd.*)	1873.				
42	Loharduggah ...	Feb. 22nd	0·04	Seasonable ...	The prospects continue pretty fair, though the crops will be short for want of rain.	
43	Singbhoom ...	" 15th	Nil.	Seasonable ...	Favorable ..	Small-pox in the town of Chaibassa is abating, and no deaths have up to date occurred from it.
44	Maunbhoom ...	" 22nd	Nil.	Fair and warmer ..	Favorable ...	What was reported as small-pox turned out to be chicken-pox, and has now disappeared.
ASSAM AND ADJACENT HILLS.						
45	Goalparah ...	" 15th	Nil.	A perceptible change in the weather; days somewhat warm and nights cold.	No crops on the ground except sugarcane, cutting of which continues. Assu (aus) paddy land is being tilled.	Some cases of small-pox near Gowalparah. Measures taken for vaccinating the villagers.
46	Kamroop ...	" 24th*	·53	Rain fell at Gowhatty early on Saturday morning, and again in the afternoon, accompanied by thunder and lightning and high wind. The preceding days of the week were very close and warm.	Land for aus crop being broken. Mustard seed nearly all gathered. Sugarcane being cut. Pulse doing well.	Public health good.
47	Durrung ...	" 15th	Nil.	Cool, foggy mornings; hot middays; little breeze.	The mustard seed crop has been housed, and has turned out a little under average. Rain wanted.	
48	Nowgong ..	" 15th	Nil.	Fair and pleasant ...	Ahu land being ploughed. Mustard being reaped. Tea good.	
49	Seebsaugor ...	" 15th	0·52	Getting warm, though mornings still foggy. A smart shower of rain during the week.	Satisfactory ...	Cholera decreasing.
50	Luckimpore ...	" 15th	0·22	Foggy mornings, with bright clear days, and marked increase in temperature. Weather generally favorable for all agricultural operations. At North Luckimpore sub-division cloudy, and rain on the 9th and 10th instant; rest of the week fine.	State of the crops satisfactory; no particular change since last week.	District healthy, and free from all epidemic diseases.
51	Naga Hills ...	" 8th	0·09	Clear and fine throughout the district.	The hill men are still busy cutting their jooms.	
52	Khasi and Jynteah Hills.	" 15th	Nil.	Fine	All the crops are off the ground. Some of the low lands being prepared for spring cultivation.	
53	Garo Hills ...	" 15th	Nil.	Fine weather. Cool winds. Nights very cold. Frost at Rongrengirri on the night of the 11th February. Atmosphere very hazy.	Jooms are being prepared; they will be fired shortly now.	

* Telegram of the 24th February received on the 25th.

Published for general information.

CALCUTTA,
The 25th February 1873.

H. J. S. COTTON,
Offg. Asst. Secy. to the Govt. of Bengal.

Weekly Report of Rainfall compiled at the Meteorological Reporter's Office.

Division.	District.	Station.	Rain from 2nd to 8th Feb. 1873.	Rain from 9th to 15th Feb. 1873.	Rain from 1st January 1873.		Remarks.
					Inches.	Up to date.	
BENGAL.							
	WESTERN DISTRICTS.		Inches.	Inches.	Inches.	1873.	
BURDWAN.	Burdwan	Burdwan	Nil.	Nil.	Nil.	15th Feb.	
		Cutwa	ditto	ditto	ditto	ditto.	
		Culna	ditto	ditto	ditto	ditto.	
		Bood-Bood	ditto	ditto	ditto	ditto.	
		Raneegunge	ditto	ditto	0·10	ditto.	
		Jehanabad	ditto	ditto	Nil.	ditto.	
	Bancoorah	Bancoorah	ditto	ditto	ditto	ditto.	
	Beerbhoom	Sooree	ditto	ditto	0·02	ditto.	
	Midnapore	Midnapore	ditto	ditto	0·18	ditto.	
		Tumlook	ditto	ditto	0·50	ditto.	
		Gurbetta	ditto	ditto	Nil.	ditto.	
		Contal Dy. Collr.'s Office	ditto	ditto	ditto	ditto	Not received 26th Jan. to 1st Feb.
		Exe. Engr.'s Office	Not rec.	Not rec.	ditto	4th Jan.	
	Hooghly	Hooghly	Nil.	Nil.	ditto	15th Feb.	
		Serampore	ditto	ditto	0·05	ditto.	
	Howrah	Howrah	ditto	ditto	0·05	ditto.	
	CENTRAL DISTRICTS.						
PRESIDENCY.	24-Pergunnahs	Saugor Island	ditto	ditto	Nil.	ditto.	
		Calcutta	ditto	ditto	ditto	ditto.	
		Alipore Dispensary	ditto	ditto	0·10	ditto.	
		Jail	ditto	ditto	Nil.	ditto.	
		Busseerhaut	ditto	ditto	ditto	ditto.	
		Baraset	ditto	ditto	ditto	ditto.	
		Diamond Harbour	ditto	Not rec.	0·45	8th Feb.	
		Barripore	ditto	Nil.	Nil.	15th Feb.	
		Satkherah	ditto	ditto	0·20	ditto.	
		Barrackpore	ditto	ditto	0·07	ditto.	
		Dum-Dum	ditto	ditto	Nil.	ditto.	
	Nuddea	Kishnaghur	ditto	ditto	ditto	ditto.	
		Bongong	ditto	ditto	0·11	ditto.	
		Meherpore	ditto	ditto	Nil.	ditto.	
		Chooadangah	ditto	ditto	ditto	ditto.	
		Kooshtea	ditto	Not rec.	0·24	8th Feb.	
		Ranaghat	ditto	Nil.	Nil.	15th Feb.	
	Jessore	Jessore	ditto	ditto	0·16	ditto.	
		Nurail	ditto	ditto	0·80	ditto.	
		Khoolneah	ditto	ditto	Nil.	ditto.	
		Jenidah	ditto	ditto	ditto	ditto.	
		Bagirhaut	ditto	ditto	ditto	ditto	Not received 19th to 25th January.
		Magoorah	ditto	ditto	ditto	ditto.	
RAJSHAHYE.	Moorshedabad	Berhampore	ditto	ditto	0·20	ditto.	
		Ramporehaut	ditto	Not rec.	Nil	8th Feb.	
		City Moorshedabad	0·11	Nil.	0·25	15th Feb.	
		Jungipore	Nil.	ditto	0·83	ditto.	
		Azimgunge	0·20	ditto	0·33	ditto.	
	Dinagepore	Dinagepore	Not rec.	Not rec.	0·50	1st Feb.	
	Maldah	Maldah	Nil.	Nil.	0·45	15th Feb.	
	Rajshahye	Beauleah	0·15	ditto	0·63	ditto.	
		Nattore	Nil.	ditto	0·51	ditto.	
	Rungpore	Rungpore	ditto	ditto	0·05	ditto.	
		Bhowanigunge	ditto	ditto	Nil.	ditto.	
		Titalya	ditto	ditto	0·20	ditto.	
	Bograh	Bograh	ditto	ditto	0·22	ditto.	
	Pubna	Pubna	0·08	ditto	0·14	ditto.	
		Serajgunge	Not rec.	ditto	0·27	ditto.	Not received 2nd to 8th February.
COOCH BEHAR.	Darjeeling	Darjeeling Telegraph Office	ditto	Not rec.	Nil.	15th Jan.	
		Hospital	Nil.	Nil.	0·02	15th Feb.	
	Julpigoree	Julpigoree	ditto	ditto	0·05	ditto.	
		Fallacotta	ditto	ditto	0·14	ditto.	
		Boda	ditto	ditto	Nil.	ditto.	
	Cooch Behar Tributary State	Cooch Behar	ditto	ditto	ditto	ditto.	
	Bhutan Dooars	Buxa	ditto	ditto	0·44	ditto.	
	EASTERN DISTRICTS.						
DACCA.	Dacca	Dacca Telegraph Office	ditto	ditto	Nil.	ditto.	
		Hospital	ditto	ditto	ditto	ditto	Not received 12th to 18th January.
		Moonsheegunge	ditto	ditto	ditto	ditto	Ditto ditto.
	Furreedpore	Manickgunge	ditto	ditto	ditto	ditto	Ditto ditto.
		Furreedpore	ditto	ditto	ditto	ditto.	
		Goalundo	ditto	ditto	ditto	ditto	
	Backergunge	Burrisaul	ditto	ditto	0·39	ditto.	
		Perozepore	ditto	ditto	Nil.	ditto.	
		Madaripore	ditto	ditto	0·05	ditto.	
		Patooakhally	ditto	ditto	Nil.	ditto.	Not received 19th to 25th Jan.
		Dowlat Khan	ditto	ditto	0·22	ditto.	
	Mymensing	Mymensing	0·10	ditto	0·20	ditto.	
		Jamalpore	Nil.	ditto	Nil.	ditto.	
		Atteah	ditto	ditto	0·24	ditto.	
		Kishoregunge	0·10	ditto	0·30	ditto.	
	Sylhet	Sylhet	Nil.	ditto	[illegible]	ditto.	
	Cachar	Cachar	0·14	ditto	[illegible]	ditto.	
		Hylakandy	0·31	Not rec.	[illegible]	8th Feb.	Not received 5th to 11th Jan. and 26th Jan. to 1st Feb.
		Koyah	0·19	Nil.	[illegible]	15th Feb.	
CHITTAGONG.	Chittagong	Chittagong Telegraph Office	Nil.	ditto	[illegible]	ditto.	
		Jail	ditto	ditto	[illegible]	ditto.	
		Cox's Bazar	ditto	Not rec.	0·90	8th Feb.	
	Chittagong Hill Tracts	Rungamuttee Hill	ditto	Nil.	0·40	15th Feb.	
	Noakhally	Noakhally	ditto	ditto	0·01	ditto.	
	Tipperah	Comillah	ditto	ditto	Nil.	ditto.	
		Brahmanbariah	0·05	ditto	0·97	ditto.	
	Hill Tipperah	Hill Tipperah	Nil.	ditto	0·29	ditto.	

Division.	District.	Station.	Rain from 2nd to 8th February 1873.	Rain from 9th to 15th Feb. 1873.	Rain from 1st January 1873.		Remarks.
					Inches.	Up to date.	
	BEHAR.		Inches.	Inches.	Inches.	1873.	
Patna.	Patna	Patna	Nil.	Nil.	0·21	15th Feb.	
		Behar	ditto	ditto	0·55	ditto.	
		Barh	0·05	ditto	0·16	ditto.	
		Dinapore Jail	Nil.	ditto	0·21	ditto.	
		Dinapore Cantonment	ditto	ditto	Nil.	ditto.	
	Gya	Gya	ditto	ditto	0·17	ditto.	
		Nowadah	ditto	ditto	0·32	ditto.	
		Aurungabad	ditto	ditto	0·12	ditto.	
		Jehanabad	Not rec.	Not rec.	0·10	18th Jan.	
	Shahabad	Arrah	0·06	Nil.	0·38	15th Feb.	
		Sasseram	Nil.	ditto	0·11	ditto.	
		Buxar	0·10	ditto	0·50	ditto.	
		Bhuboosah	Nil.	ditto	Nil.	ditto.	
	Tirhoot	Mozufferpore	ditto	ditto	2·20	ditto.	
		Durbangah	ditto	ditto	0·02	ditto	Not received 1st to 4th January.
		Hajipore	ditto	ditto	0·15	ditto	Not received 26th Jan. to 1st Feb.
		Mudhubani	Not rec.	Not rec.	0·18	25th Jan.	
		Seetamaree	Nil.	Nil.	0·29	15th Feb.	
		Tajpore	ditto	Not rec.	0·25	8th Feb.	Not received 1st to 4th and 12th to 25th January.
	Sarun	Chuprah	ditto	Nil.	0·29	15th Feb.	
		Sewan	0·02	0·04	0·40	ditto.	
	Chumparun	Moteehari	Nil.	Nil.	0·90	ditto.	
		Bettiah	ditto	ditto	0·25	ditto.	
Bhaugulpore.	Monghyr	Monghyr	ditto	ditto	0·34	ditto.	
		Begooserai	ditto	ditto	0·20	ditto	Not received 5th to 11th January.
		Jamooie	ditto	ditto	0·73	ditto.	
	Bhaugulpore	Bhaugulpore	ditto	ditto	0·40	ditto.	
		Soopool	ditto	ditto	Nil.	ditto.	
		Mudheypoorah	ditto	ditto	ditto	ditto.	
		Banka	ditto	ditto	0·70	ditto.	
	Purneah	Purneah	ditto	ditto	0·27	ditto.	
		Kishengunge	ditto	ditto	Nil.	ditto.	
		Arrareah	ditto	ditto	ditto	ditto.	
	Sonthal Pergunnahs	Deoghur	ditto	ditto	0·29	ditto.	
		Jamtara	ditto	ditto	Nil.	ditto.	
		Rajmehal	ditto	ditto	ditto	ditto.	
		Pakour	ditto	ditto	ditto	ditto.	
		Nya-Doomka	ditto	ditto	0·26	ditto.	
		Godda	ditto	ditto	0·62	ditto.	
	ORISSA.						
Orissa.	Cuttack	Cuttack Telegraph Office	ditto	ditto	Nil.	ditto.	
		Cuttack Hospital	ditto	ditto	ditto	ditto.	
		Jajipore	ditto	Not rec.	ditto	8th Feb.	
		Kendrapara	ditto	ditto	ditto	ditto.	
		Jugutsingpore	ditto	ditto	0·76	ditto.	
		False Point	ditto	Nil.	Nil.	15th Feb.	
	Pooree	Pooree	ditto	ditto	ditto	ditto.	
		Khoordah	ditto	ditto	0·08	ditto.	
	Balasore	Balasore	ditto	ditto	Nil.	ditto.	
		Bhuddruck	ditto	ditto	ditto	ditto.	
	Cuttack Tributary Mehals	Sambalpore	Not rec.	Not rec.	......	......	
	CHOTA NAGPORE.						
	SOUTH-WESTERN FRONTIER AGENCY.						
	Hazareebaugh	Hazareebaugh Jail	Nil.	Nil.	Nil.	15th Feb.	
		Hazareebaugh Dispensary	ditto	ditto	ditto	ditto.	
		Pachumba	ditto	ditto	ditto	ditto.	
	Lohardugga	Ranchee	ditto	ditto	ditto	ditto.	
		Palamow	ditto	ditto	ditto	ditto.	
	Singbhoom	Chyebassa	ditto	ditto	0·19	ditto.	
	Maunbhoom	Purulia	ditto	ditto	Nil.	ditto	
		Gobindpore	ditto	ditto	ditto	ditto	Not received 26th Jan. to 1st Feb.
	ASSAM & ADJACENT HILLS.						
	Goalparah	Goalparah	ditto	ditto	ditto	ditto.	
		Dhoobree	ditto	ditto	ditto	ditto.	
	Kamroop	Gowhatty	ditto	ditto	0·11	ditto.	
		Burpettah	ditto	ditto	0·30	ditto.	
	Durrung	Tezpore	0·12	Not rec.	0·52	8th Feb.	
		Mungledye	Nil.	ditto	0·33	ditto.	
	Nowgong	Nowgong	ditto	Nil.	0·05	15th Feb.	
	Seebsaugor	Seebsaugor	0·68	Not rec.	1·89	8th Feb.	
		Golaghat	Nil.	ditto	0·67	ditto.	
		Jorehaut	0·80	ditto	1·86	ditto.	
		Nazeerah	Not rec.	ditto	......	......	
	Luckimpore	Debrooghur	0·68	ditto	1·53	8th Feb.	
		North Luckimpore	0·65	ditto	1·45	ditto.	
		Suddya	0·65	ditto	2·28	ditto.	
	Naga Hills	Samoogoodting	Not rec.	ditto	......	......	
	Khasi and Jynteah Hills.	Shillong	Nil.	Nil.	Nil.	15th Feb.	
		Jaowai	ditto	ditto	ditto	ditto.	
		Cherrapoonjee	0·04	ditto	0·25	ditto.	
	Garo Hills	Tura	Nil.	ditto	0·43	ditto.	
		Benares	ditto	ditto	Nil.	ditto.	
		Akyab	ditto	ditto	0·60	ditto.	

CALCUTTA,
The 22nd February 1873.

H. F. BLANFORD,
Meteorological Reporter to the Govt. of Bengal.

Meteorological Telegraphic Report for the period 16th to 22nd February 1873.

Stations.	Date.	Hour.	Barometer reduced to 32°.	Barometer reduced to sea-level.	Thermometer.		Humidity Sat. =100	Wind.		Rain.	Clouds.	Weather initials.
					Dry	Wet		Direction.	* Velocity.			
	Feb.											
Calcutta.	16th	10	30·005	30·024	74·5	61·0	41	N W	...	...	......	*b*
		16	29·870	29·888	84·4	65·5	31	W N W	...	...	......	*b*
	17th	10	30·011	30·030	72·5	69·0	82	S by E	...	...	......	*b*
		16	29·892	29·910	86·5	71·2	44	W by N	...	...	C	
	18th	10	30·071	30·089	77·5	69·9	66	S S W	..	...	C	
		16	29·970	29·983	86·7	69·2	37	W N W	...	...	C	
	19th	10	30·111	30·129	77·2	67·0	56	W by N	...	...	......	*b*
		16	29·956	29·974	87·0	71·4	43	W by N	...	...	C	
	20th	10	30·048	30·066	76·0	66·5	58	W	...	...	C	
		16	29·878	29·896	89·0	71·0	37	W S W	.	...	......	*b*
	21st	10	29·923	29·941	79·5	68·5	54	N W	...	...	C	
		16	29·782	29·800	87·5	70·8	40	W by S	.	...	C K	
	22nd	10	29·958	29·976	80·0	71·9	65	S S E	...	...	......	*b*
		16	29·834	29·852	88·3	71·7	41	W N W	.	...	......	*b*
Saugor Island.	16th	10	30·058	30·064	74	67	67	N W	1·9	...	......	*b*
		16	29·911	29·917	80	62	30	S W	8·0	...	......	*b*
	17th	10	30·048	30·054	79	73	73	S W	16·0	...	......	*b*
		16	29·952	29·958	82	73	63	S S W	2·2	...	......	*b*
	18th	10	30·091	30·097	78	73	77	S W	2·7	...	C	*b*
		16	30·018	30·024	81	72	62	S W	10·9	...	C	*b*
	19th	10	30·060	30·066	78	73	77	W	3·4	...	C	*b*
		16	29·995	30·001	83	72	56	S	9·7	...	C	*b*
	20th	10	30·066	30·072	80	74	74	S W	8·0	...	C	*b*
		16	29·917	29·923	82	73	63	S	11·8	...	......	*b*
	21st	10	29·963	29·969	81	67	44	N N W	4·5	...	......	*b, m*
		16	29·829	29·835	83	73	60	S	7·2	...	C	*b*
	22nd	10	29·969	29·975	82	74	66	W S W	8·1	...	K	*b*
		16	29·853	29·859	82	74	66	S	13·0	...	K	*b*
Chittagong.	16th	10	29·911	30·005	75	64	51	N	5·6	...	......	*b, m*
		16	29·800	29·893	80	65	40	W	7·9	...	......	*b, m*
	17th	10	29·908	30·002	77	68	60	N N W	4·3	...	......	*b, m*
		16	29·827	29·920	80	70	58	W S W	10·1	...	......	*b, m*
	18th	10	29·891	29·986	71	66	75	N	4·5	...	......	*b, m*
		16	29·884	29·976	84	69	43	W S W	6·8	...	C	*b, m*
	19th	10	30·026	30·120	77	68	60	N N E	5·7	...	......	*b, m*
		16	29·889	29·981	84	70	46	W	6·7	...	C	*b, m*
	20th	10	29·983	30·076	80	70	58	E S E	3·9	...	......	*b, m*
		16	29·827	29·920	83	70	52	S W	8·7	...	......	*b, m*
	21st	10	29·853	29·948	80	72	66	S W	4·3	...	......	*b, m*
		16	29·735	29·827	84	71	50	S W	8·9	...	CK	*b, m*
	22nd	10	29·905	29·998	80	71	62	N N W	3·6	...	K	*b, m*
		16	29·690	29·782	87	76	58	W N W	6·2	...	C, CK	*b, m*
Madras.	15th	10	30·018	30·048	83	74	63	N E by E	10	...	......	*c*
		16	29·894	29·924	82	73	63	E N E	10	...	......	*c*
	16th	10	29·994	30·024	82	75	70	E	8	...	......	*c*
		16	29·898	29·928	82	72	59	N E	11	...	......	*b*
	17th	10	30· 13	30·043	80	72	66	N N W	4	...	......	*c*
		16	29·883	29·913	82	75	70	E	9	...	......	*b*
	18th	10	30·037	30·067	84	76	67	E	10	...	......	*c*
		16	29·933	29·963	84	76	67	E by N	10	...	......	*c*
	19th	10	30·036	30·096	85	78	64	E N E	12	...	......	*c*
		16	29·951	29·981	82	73	63	E N E	12	...	......	*c*
	20th	10	30·048	30·078	82	74	63	N E by E	7	...	......	*c*
		16	29·886	29·916	84	73	56	N E by N	12	...	......	*b*
	21st	10	29·967	29·997	84	76	67	N E	4	...	......	*b*
		16	29·831	29·861	84	76	67	E	7	...	......	*b*
Cuttack.	15th	10	29·981	30·064	78	69	61	N	0·9	...	......	*b*
		16	29·835	29·917	89	67	26	E	2·8	...	C	*b*
	16th	10	29·939	30·022	81	71	59	S S W	0·9	...	......	*b*
		16	29·785	29·867	89	70	35	E	3·0	...	......	*b*
	17th	10	29·936	30·019	80	69	54	W	1·2	...	C	*b*
		16	29·820	29·902	89	67	26	S E	1·6	...	......	*b*
	18th	10	30·009	30·092	79	70	61	S S W	0·4	...	C, S	
		16	29·893	29·975	89	68	20	E S E	2·1	...	S	*b*
	19th	10	30·039	30·122	79	66	47	W N W	1·2	..	......	
		16	29·893	29·975	89	68	29	S E	3·2	...	K, S C	*b*
	20th	10	29·999	30·082	79	70	61	S W	0·9	...	......	*b*
		16	29·823	29·904	90	70	32	S W	2·9	...	......	*b*
	21st	10	29·873	29·956	83	66	38	W	1·1	...	......	
		16	29·723	29·804	91	69	28	S	2·8	...	C S	*b*
Akyab.	16th	10	29·983	30·005	76	67	60	E N E	0·1	...	......	*b*
		16	29·869	29·891	81	69	51	W	2·0	...	......	*b*
	17th	10	30·006	30·028	76	67	60	N E	0·3	..	......	*b*
		16	29·902	29·924	80	69	54	W	2·1	...	......	*b*
	18th	10	30·107	30·129	76	68	64	E N E	0·2	...	......	*b*
		16	29·936	29·958	81	72	62	W	4·3	...	......	*b*
	19th	10	30·080	30·102	76	68	64	N E	0·2	...	......	*m*
		16	29·954	29·976	82	72	59	S W	0·3		......	*b*
	20th	10	30·060	30·082	78	69	61	E N E	1·0	...	......	*m*
		16	29·886	29·908	82	69	48	W	0·8	..	......	*b*
	21st	10	29·938	29·960	76	70	72	E	2·0	...	......	*b*
		16	29·822	29·844	80	73	70	W	6·3	...	......	*b*
	22nd	10	29·980	30·002	75	71	81	E N E	0·1	...	......	*b*
		16	29·859	29·881	80	74	74	W	5·0	...	......	*b*

* Velocity of wind in miles per hour.

Calcutta,
The 22nd February 1873.

H. F. Blanford,
Meteorological Reporter to the Government of Bengal.

Results of the Meteorological Observations taken at the Surveyor-General's Office, Calcutta, from 15th to 21st February 1873.

Month.	Date.	Mean reduced barometer.	THERMOMETER.			Mean dry bulb.	Mean wet bulb.	Computed mean dew-point.	Mean degree of humidity.	WIND			Rain.	Moon's phases.	GENERAL REMARKS.
			Highest reading.	Lowest reading.	Max. solar radiation.					Prevailing direction.	Max. pressure.	Daily velocity.			
		Inches.	°	°	°	°	°	°			℔	Miles.	In.		
Feb. ...	15th	29·976	83·2	59·8	135·0	70·9	60·9	52·9	0·55	N W & E N E	...	102·0	...	...	Clear.
	16th	·935	84·4	60·5	140·5	71·8	62·1	54·3	·56	W N W & N N W	...	79·0	...	...	Clear. Slightly foggy at 8 P.M.
	17th	·945	86·5	63·0	142·5	73·5	66·9	62·3	·69	W by S & S S W	...	74·0	...	...	Clear and Cirri. Foggy from 5 to 9 A.M.
	18th	·995	86·7	66·0	144·0	75·5	67·6	62·1	·65	S S W	...	84·5	...	...	Clear and Cirri. Foggy from 4 to 7 A.M.
	19th	30·022	87·7	65·5	142·0	75·7	67·4	61·6	·63	W S W & N W	...	79·9	...	...	Chiefly Cirri.
	20th	29·956	89·0	66·5	141·5	76·6	67·7	61·5	·61	S S W	...	80·5	...	☾	Cirri and Clear.
	21st	8 53	88·0	68·0	142·8	77·3	69·0	63·2	·63	W by S	...	115·3	...	...	Clear and Cirrocumuli.

The mean barometer as likewise the dry and wet bulb thermometer means are derived from the twenty-four hourly observations made during the day.

The dew-point is computed with the Greenwich constants.—The figures in column 10 represent the humidity of the air, the complete saturation of which being taken at unity. The receiver of the lower rain gauge is 1½ feet, and that of the anemometer 70 feet 10 inches above the level of the ground. The velocity of wind, as indicated by Robinson's anemometer, is registered from noon to noon.

		°
The extreme variation of temperature during the past seven days	...	29·2
The max. temperature during the past seven days	...	89·0
The max. temperature during the corresponding period of the past year	...	83·2
The mean humidity during the past seven days	...	0·62
The mean humidity during the corresponding period of the past year	...	0·71
		Inches.
The total fall of rain from 15th to 21st ... by lower rain gauge	...	Nil.
The total fall of rain from 15th to 21st ... by anemometer gauge	...	Nil.
Ditto ditto ditto average of nineteen previous years	...	0·16
Ditto ditto between the 1st January and the 21st February	..	Nil.
Ditto ditto ditto ditto, average of nineteen previous years	...	1·23

GOPEENAUTH SEN,
In charge of the Observatory.

The 24th February 1873.

GOVERNMENT OF BENGAL.

PUBLIC WORKS DEPARTMENT,—IRRIGATION BRANCH.

KHURREEF SEASON 1872, COMMENCING ON THE 1ST DECEMBER 1872.

Irrigation Operations of Lower Bengal during the month of December 1872.

Circle.	District.	Canal.	WATER SUPPLIED DURING 1872.		DALWA RICE IRRIGATION.			TOBACCO, COTTON, HULDEE, GINGER, WHEAT, AND GARDEN PRODUCE.			OIL-SEEDS AND PULSES.			SUGAR-CANE AND OTHER CROPS.			Grand total of area leased up to end of the month (total of columns 8, 11 14, and 17).	Grand total of corresponding period of last year.	RAINFALL.			REMARKS.
			Estimated full discharge in cubic feet per second.	Average discharge in cubic feet per second throughout the month.	Area leased up to the 1st of the month.	Area leased during the month.	Total area leased up to the end of the month.	Area leased up to the 1st of the month.	Area leased during the month.	Total area leased up to the end of the month.	Area leased up to the 1st of the month.	Area leased during the month.	Total area leased up to the end of the month.	Area leased up to the 1st of the month.	Area leased during the month.	Total area leased up to the end of the month.			Inches during month.	Inches up to-date.	Average of ten previous years for the same period.	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	
Orissa ...	Cuttack ...	High Level, Range I. ...	......	......	...	...	...	1	......	1	...	...	...	...	...	...	1	...	Nil	76·06	56·97	Canal closed for repairs.
	Ditto ...	Kendraparah ...	1,262	516·8	...	156	156	155	519	674	2	22	24	...	...	...	854	...	Nil	76·06	56·97	The Canal was closed up to the 5th, and water reached Muntri escape on 10th.
	Ditto ...	Taldunda ...	1,300	8·69	...	...	...	1	......	1	...	...	...	...	...	...	1	...	Nil	76·06	56·97	Water let into the Canal on 20th.
	Ditto ...	Machgong ...	650	7·73	...	...	...	......	......	......	...	...	...	...	...	...	......	...	Nil	76·06	56·97	Ditto ditto.
South-Western.	Midnapore ...	Midnapore ...	875	...	...	...	...	......	......	......	...	...	...	...	...	...	......	...	0·23	58·50	Not available.	No irrigation.
	Howrah ...	Panchkoorah ...	240	...	...	162	162	......	......	......	...	...	...	...	...	...	162	...	Nil	36·95	Ditto.	Water given gratis in consequence of heavy losses sustained by ryots in the late floods.
				Total ...		318	318	157	519	676	2	22	24	...	...	...	1,018	...				

The 24th February 1873.

F. T. HAIG, *Lieut.-Colonel, R. E.,*
Offg. Joint-Secretary to the Government of Bengal
in the P. W. Dept., Irrigation Branch.

Weekly Return of Traffic Receipts on Indian Railways.

EAST INDIAN RAILWAY—JUBBULPORE LINE.

Approximate Return of Traffic for week ended 8th February 1873, on 223½ miles open.

	COACHING TRAFFIC.			MERCHANDISE AND MINERAL TRAFFIC.			Total receipts.
	Number of passengers.	Coaching receipts.		Weight carried.	Receipts.		
		Rs. A. P.	£ s. d.	Mds. Srs.	Rs. A. P.	£ s. d.	£ s. d.
Total traffic for the week	5,022	17,219 10 4	1,578 9 4	79,943 20	24,683 5 0	2,262 12 9	3,841 2 1
Or per mile of railway	......	77 0 9	7 1 3	......	110 7 0	10 2 6	17 3 9
For previous 5 weeks of half-year ...	22,955	71,275 10 8	6,533 12 1	308,018 0	100,838 4 6	9,243 10 2	15,777 2 3
Total for 6 weeks	27,977	88,495 5 0	8,112 1 5	387,961 20	125,521 9 6	11,506 2 11	19,618 4 4
COMPARISON.							
Total for corresponding week of previous year	5,763	18,268 12 11	1,674 12 10	71,596 20	18,090 0 3	1,658 5 0	3,332 17 10
Per mile of railway corresponding week of previous year	......	81 14 9	7 10 2	......	81 1 11	7 8 9	14 18 11
Total to corresponding date of previous year	32,030	98,750 6 7	9,052 2 5	457,891 10	117,427 15 9	10,764 4 7	19,816 7 0

NOTE.—To the merchandise traffic for week ending 8th February 1873, is added mds. 8,564-20, Rs. 2,362-8 for invoices of to pay traffic issued in week ending 25th January 1873, received at inward stations after the close of their returns for that week. Since week ending 25th January, the system has been introduced of accounting for invoices in returns of the week corresponding with the dates of the invoices under the system previously existing to pay invoices not to hand at inward stations at the expiration of the week in which the were issued from outward stations were accounted for in the following week or that in which received.

It will thus happen that the audited returns for week ending 25th January 1873, will include not only all the invoices *issued* during that week, but also such to pay invoices issued in previous weeks as may not have been received until week ending 25th January 1873.

EAST INDIAN RAILWAY—MAIN LINE.

Approximate Return of Traffic for week ended 8th February 1873, on 1,280 miles open.

		Rs. A. P.	£ s. d.	Mds. Srs.	Rs. A. P.	£ s. d.	£ s. d.
Total traffic for the week	104,876	1,63,449 2 11	14,982 16 10	879,776 0	4,41,054 14 9	40,430 0 8	55,412 17 6
Or per mile of railway	......	127 11 2	11 14 1	......	344 9 2	31 11 9	43 5 10
For previous 5 weeks of half-year...	470,744	7,22,635 11 10	66,241 12 2	3,346,331 30	17,25,950 13 3	158,212 3 3	224,453 15 5
Total for 6 weeks	575,620	8,86,084 14 9	81,224 9 0	4,226,107 30	21,67,005 12 0	198,642 3 11	279,866 12 11
COMPARISON.							
Total for corresponding week of previous year	105,707	1,63,991 11 11	15,032 11 6	829,811 30	4,62,796 8 7	42,422 14 10	57,455 6 4
Per mile of railway corresponding week of previous year	......	128 1 11	11 14 11	......	361 8 11	33 2 10	44 17 9
Total to corresponding date of previous year	589,821	9,16,258 4 5	83,990 6 10	4,407,727 10	27,93,513 2 0	256,072 0 9	340,062 7 7

NOTE.—To the merchandise traffic for week ending 8th February 1873, is added mds. 1,22,365-20, Rs. 74,220-6-6 for invoices of to pay traffic issued in week ending 25th January 1873, received at inwards stations after the close of their returns for that week. Since week ending 25th January 1873, the system has been introduced of accounting for invoices in returns of the week corresponding with the dates of the invoices under the system previously existing to pay invoices not to hand at inward stations at the expiration of the week in which they were issued from outward stations were accounted for in the following week or that in which received.

It will thus happen that the audited returns for week ending 25th January 1873, will include not only all the invoices *issued* during that week, but also such to pay invoices issued in previous weeks as may not have been received until week ending 25th January 1873.

NALHATI STATE RAILWAY.

Approximate Return of Traffic for week ended 15th February 1873, on 27¼ miles open.

		Rs. A. P.	£ s. d.	Mds. Srs.	Rs. A. P.	£ s. d.	£ s. d.
Total traffic for the week	1,387	1,073 0 0	107 6 0	5,118 0	390 0 0	39 0 0	146 6 0
Or per mile of railway	51	39 8 0	3 19 0	187 0	14 0 0	1 8 0	5 7 0
For previous 6 weeks of half-year...	8,871¼	6,396 0 0	639 12 0	33,438 0	2,857 0 0	285 14 0	925 6 0
Total for 7 weeks ...	10,258¼	7,469 0 0	746 18 0	38,556 0	3,247 0 0	324 14 0	1,071 12 0
COMPARISON.							
Total for corresponding week of previous year	......	......	......	......	......	......	......
Per mile of railway corresponding week of previous year ...	......	......	......	......	......	......	......
Total to corresponding date of previous year	......	......	......	......	......	......	......

CALCUTTA AND SOUTH-EASTERN STATE RAILWAY.

Approximate Return of Traffic for week ended 15th February 1873, *on* 28 *miles open.*

	COACHING TRAFFIC.			MERCHANDISE AND MINERAL TRAFFIC.			Total receipts.
	Number of passengers.	Coaching receipts.		Weight carried.	Receipts.		
		Rs. A. P.	£ s. d.	Mds. Srs.	Rs. A. P.	£ s. d.	£ s. d.
Total traffic for the week	8,615	1,347 0 0	134 14 0	20,382 0	606 0 0	60 12 0	195 6 0
Or per mile of railway	308	48 0 0	4 16 0	764 0	22 0 0	2 4 0	7 0 0
For previous 6 weeks of half-year	51,318	7,366 0 0	736 12 0	87,756 0	2,928 0 0	292 16 0	1,029 8 0
Total for 7 weeks	59,933	8,713 0 0	871 6 0	108,138 0	3,534 0 0	353 8 0	1,224 14 0
COMPARISON.							
Total for corresponding week of previous year	8,215	1,180 4 3	118 18 7	20,291 20	653 8 0	65 7 0	184 5 7
Per mile of railway corresponding week of previous year	293	42 7 7	4 4 11	724 28	23 5 5	2 6 8	6 11 7
Total to corresponding date of previous year	59,081½	8,231 11 6	823 3 6	110,979 20	3,043 9 6	304 7 3	1,127 10 9

EASTERN BENGAL RAILWAY.

Approximate Return of Traffic for week ended 15th February 1873, *on* 156½ *miles open.*

		Rs. A. P.	£ s. d.	Mds. Srs.	Rs. A. P.	£ s. d.	£ s. d
Total traffic for the week	34,081	34,876 9 3	3,197 0 5	155,065 25½	31,953 13 0	2,929 1 11	6,126 2 4
Or per mile of railway	218	222 13 8	20 8 7	991 0	204 2 10	18 14 4	39 2 11
For previous 6 weeks of half-year	178,172	1,54,049 6 0	14,121 3 9	621,730 3	1,34,559 6 6	12,334 12 2	26,455 15 11
Total for 7 weeks ...	212,253	1,88,925 15 3	17,318 4 2	776,795 28½	1,66,513 3 6	15,263 14 1	32,581 18 3
COMPARISON.							
Total for corresponding week of previous year	30,722½	21,603 13 6	1,980 7 1	93,048 25	19,439 8 3	1,781 19 1	3,762 6 2
Per mile of railway corresponding week of previous year ...	196	138 0 8	12 13 1	595 0	124 3 5	11 7 9	24 0 10
Total to corresponding date of previous year ...	218,683½	1,43,294 15 0	13,135 7 5	722,886 11	1,47,200 0 8	13,493 6 9	26,628 14 2

EAST INDIAN RAILWAY—MAIN LINE.

Approximate Return of Traffic for week ended 15th February 1873, *on* 1,280 *miles open.*

		Rs. A. P.	£ s. d.	Mds. Srs.	Rs. A. P.	£ s. d.	£ s. d.
Total traffic for the week	116,820	1,78,114 12 10	16,327 3 10	816,901 20*	4,16,192 5 0*	38,150 19 2	54,478 3 0
Or per mile of railway	......	139 2 5	12 15 2	......	325 2 5	29 16 1	42 11 3
For previous 6 weeks of half-year...	575,620	8,86,084 14 9	81,224 9 0	4,226,107 30	21,67,005 12 0	198,642 3 11	279,866 12 11
Total for 7 weeks	692,440	10,64,199 11 7	97,551 12 10	5,043,009 10	25,83,198 1 0	236,793 3 1	334,344 15 11
COMPARISON.							
Total for corresponding week of previous year	108,238	1,71,249 13 11	15,697 18 1	807,035 10	4,74,022 4 3	43,452 0 10	59,149 18 11
Per mile of railway corresponding week of previous year	......	133 12 8	12 5 4	......	370 5 3	33 18 11	46 4 3
Total to corresponding date of previous year	698,059	10,87,508 2 4	99,688 4 11	5,214,762 20	32,67,535 6 3	299,524 1 7	399,212 6 6

* Mds. 9,573-20 and Rs. 9,077-12-3 added to merchandise traffic, being difference between estimated and actual traffic for previous weeks for stations from which returns had not come to hand when closing the statements for those weeks.

EAST INDIAN RAILWAY—JUBBULPORE LINE.

Approximate Return of Traffic for week ended 15th February 1873, *on* 223½ *miles open.*

		Rs. A. P.	£ s. d.	Mds. Srs.	Rs. A. P.	£ s. d.	£ s. d.
Total traffic for the week	5,224	16,562 8 7	1,518 4 8	69,094 20	21,664 5 3	1,985 17 11	3,504 2 7
Or per mile of railway	......	74 1 8	6 15 10	......	96 14 11	8 17 9	15 13 7
For previous 6 weeks of half-year...	27,977	88,495 5 0	8,112 1 5	387,961 20	1,25,521 9 6	11,506 2 11	19,618 4 4
Total for 7 weeks	33,201	1,05,057 13 7	9,630 6 1	457,056 0	1,47,185 14 9	13,492 0 10	23,122 6 11
COMPARISON.							
Total for corresponding week of previous year...	5,180	17,653 10 2	1,618 5 0	64,452 10	17,549 8 5	1,608 14 2	3,226 19 2
Per mile of railway corresponding week of previous year	......	79 2 7	7 5 2	......	78 11 2	7 4 3	14 9 5
Total to corresponding date of previous year	37,210	1,16,404 0 9	10,670 7 5	522,343 20	1,34,977 8 2	12,372 18 9	23,043 6 2

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[REGISTERED No. 29.]

No. 10 of 1873.

SUPPLEMENT TO
The Calcutta Gazette.

WEDNESDAY, MARCH 5, 1873.

OFFICIAL PAPERS.

Non-Subscribers to the GAZETTE *may receive the* SUPPLEMENT *separately on payment of Six Rupees per annum if delivered in Calcutta, or Twelve Rupees if sent by Post.*

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GOVERNMENT OF INDIA.

HOME DEPARTMENT.

TREATMENT OF SNAKE-BITE BY MEANS OF THE INJECTION OF AMMONIA AND BY OTHER REMEDIES.

The following papers on the subject of the treatment of snake-bite are published for general information:—

In pages 283 to 296 is reprinted a paper read before the Medical Society of Victoria by Professor George B. Halford, M.D., in June 1870, and published in the Australian Medical Journal, together with an Appendix. Dr. Halford is an advocate of the treatment of snake-bite by injection of Ammonia.

The pages which follow contain the remarks (in some cases abstracted) of the Officers of the Indian Medical Service to whom copies of Dr. Halford's pamphlet were forwarded.

THE TREATMENT OF SNAKE-BITE IN VICTORIA:

BY GEORGE B. HALFORD, M. D.,

MEMBER OF THE ROYAL COLLEGE OF PHYSICIANS OF LONDON, PROFESSOR OF ANATOMY, PHYSIOLOGY, AND PATHOLOGY IN THE UNIVERSITY OF MELBOURNE.

[Being a paper read before the Medical Society of Victoria, June 1st 1870.]

MR. PRESIDENT AND GENTLEMEN,—When for this paper I first took pen in hand, my intention was to answer some false statements concerning me which appeared in the *Lancet* of May 26, and which were re-published in some of the daily papers of this city; but, as I reviewed the doings of the past eighteen months, I quite forgot the *Lancet* and the papers. Hence, Sir, I must apologise for saying nothing about them, and for changing the title of my paper from "A reply to the *Lancet*, &c.," to "The Treatment of Snake-bite in Victoria."

The 1st case in which liquor ammoniæ was injected, from my previous suggestions, into the human veins, occurred at Beechworth, 185 miles from Melbourne, in the practice of Dr. Dempster. A man had been bitten at 8 in the morning, and was insensible and apparently dying at noon. Dr. Dempster injected twelve minims of liq. ammoniæ fort., diluted with water, into the saphena vein. The patient woke up immediately, and presently recovered. As this is the first recorded case, it is as well to state that the remedy was used as a *dernier ressort.* Had Dr. Dempster any probability of saving his patient by other means, he would not have injected ammonia; but having done so, and with immediately perceptible good effects, he attributed the man's recovery to the injection of ammonia. Dr. Dempster's account of this case at once attracted the attention of the medical profession of this colony.

The 2nd case was in the practice of Mr. Arnold, of Elsternwick, who, assisted by Mr. A'Beckett, of St. Kilda, near Melbourne, failed to arrest by ordinary means the progress of the poisoning. When the man was insensible to sound and light, I at their request injected thirty minims of liquor ammoniæ, B. P. sp. gr. ·959, into the superficial radial vein. The patient at once roused, and conversed with those about him. The species of snake was *Hoplocephalus superbus.*

The 3rd case is recorded in the New South Wales papers, but I have failed in getting full particulars, Dr. Irwin, the medical practitioner, having since died.

The 4th case—a man was bitten at Moyston, 146 miles from Melbourne. The patient was comatose, and fast sinking. Liquor ammoniæ was injected into the basilic vein, and recovery followed. In a letter to me, Dr. O'Grady states that, "but for injection of ammonia, the man would have died."

The 5th case—a girl, aged 14. The symptoms were total paralysis, complete stupor. Fifteen minims of liquor ammoniæ were injected into the median vein by Mr. Barnett, of Smythesdale, 107 miles from Melbourne, and the patient was roused in a few minutes, and recovered. The species of snake was *Hoplocephalus curtus.*

The 6th case occurred at Mornington, 35 miles from Melbourne. The boy was insensible. Mr. Lane injected thirty minims of liquor ammoniæ into the basilic vein. The previously dilated and insensible pupils immediately contracted, and consciousness returned, and recovery followed.

The 7th case—a child, aged nine years,—was perfectly insensible; pupils fixed and dilated. This happened at Seymour, 64 miles from Melbourne. Diluted ammonia was injected into a vein at the bend of the elbow, by Messrs. Henshall and Stillman, and the child roused immediately, and recovered in a few hours.

Case 8 is a somewhat doubtful case, the child, aged 9 years, having been brought to the hospital at Kyneton, 56 miles from Melbourne, 27 hours after the accident. Five minims of liquor ammoniæ fort., with twenty-five of warm water, were injected into the basilic vein. Before the injection the pulse was intermitting frequently, the extremities cold, and the pupils dilated and insensible to light; there was also locked-jaw. Four hours after, a similar dose was again injected. No apparent effect followed the use of the remedy, and the child died, remaining perfectly sensible to the last.

Case 9.—Dr. Rae, of Bacchus Marsh, 34 miles from Melbourne, injected thirty minims of liquor ammoniæ and thirty of water into the basilic vein of a man who was perfectly insensible, cold, and, according to the Doctor's belief, on the point of dying. The patient roused in one minute after the injection, and in less than half-an-hour walked away, recovered.

Case 10.—Symptoms in this case not severe; more like those of drunkenness. Dr. Starke, of Creswick, 109 miles from Melbourne, injected ammonia into a vein, and the boy recovered unusually quickly.

Case 11.—In which a man was believed to be sinking, having been bitten twice by an infuriated brown snake *(Diemenia superciliosa)*, was roused in one minute by an injection of ammonia into the vein; but the bitten parts not having been excised, and a ligature loosened after the supposed recovery, all the worst symptoms returned, and a repetition of the injection five times was required in order to thoroughly restore the patient. This occurred in the practice of Dr. Dowling, of Talbot, 131 miles from Melbourne.

Case 12.—A woman was bitten at Tarraville, in Gipps Land, 207 miles from Melbourne. She was described by Dr. Eccles as cold, pulseless, insensible, and on the point of dying. The veins were twice injected with liquor ammoniæ, and consciousness returned in twenty minutes. The circulation was restored immediately upon the injection.

Case 13.—The only interest about this case, which occurred at Taradale, 67 miles from Melbourne, is that ammonia was injected, by Drs. Crooke and Hutchison, both into the vein and subcutaneously; and that after the circulation had been restored by the injection, she roused and recovered.

Case 14.—In the practice of Dr. Langford, of the Kyneton hospital, in which thirty-six minims of liquor ammoniæ, B. P. sp. gr. ·959, were injected into a vein of the fore-arm of a woman, who was totally paralysed, insensible, and in a most alarming condition. She roused immediately, and walked about the ward without assistance.

Case 15.—A boy, aged 12, was bitten at Devil's Creek, and became pulseless, comatose, and totally helpless; the pupils dilated and insensible to light. Six drops of liquor ammoniæ fortissimus, with two drachms of water, were injected into a vein of the fore-arm. Consciousness at once returned, the pulse rose, and recovery ensued. My authorities for this case are the boy's own father, Mr. Richardson, and Mr. Walpole.

Case 16.—A man was brought to Dr. Rae, of Colac, 92 miles from Melbourne. He had been bitten at 12-30 P. M., and at 4-30 P. M. was comatose, the pupils were dilated and insensible to light, and the extremities cold. Ammonia of a gradually increasing strength was injected ten different times into a vein in each arm, until one drachm and a half of liquor ammoniæ fortissimus had been used. The pulse and breathing improved, the pupils contracted, the jaw, which had fallen, drew up, and, to the astonishment of everybody, he walked away in two hours.

Case 17.—A woman was bitten at Bambra, and soon became drowsy and helpless. On arriving at Winchelsea, a distance of 14 miles, she was completely comatose, and was carried into the house. The pupils were fixed, dilated, and insensible to light. Dr. Meyler injected ten minims of liquor ammoniæ fortissimus, mixed with fifty of water, into the cephalic vein. During the operation she was quite insensible. Before half a minute had elapsed, she roused up into consciousness, the pulse became fuller, and the temperature of the body sensibly increased. In a quarter of an hour she began to eat bread and butter, and from that time rapidly recovered.

Case 18.—A woman was bitten at Tumbacumba, New South Wales, between 9 and 10 A. M., and having had ammonia injected under the skin, was at 5-30 P. M. quite helpless, pale, and nearly insensible. Twelve minims of liquor ammoniæ fortissimus, mixed with twenty-four of water, were injected into a vein of the arm previously laid bare. Half was first injected, and the remainder after the lapse of ten minutes. It had an almost instantaneous and magical effect, consciousness returning, with free use of the muscles, succeeded by cheerfulness. By-and-bye the bad symptoms returned, and the injection was twice repeated and recovery followed. She had no recollection of anything that occurred from the time of stupor setting in, at noon, till near midnight. My authority for this case is Mr. R. D. Mathews, whose hypodermic syringe was used.

Case 19 has been communicated to me by Dr. Bennett, of Albury, 207 miles from Melbourne. A child, aged 7 years, was supposed to have been bitten by a snake in the morning. No particular symptoms occurred till 7-30 P. M. Drs. Bennett and Keating found him pale, the skin cold and clammy, the pulse 120, the pupils widely dilated, very drowsy but easily aroused, and able to answer any question very sensibly. Liquor ammoniæ was injected into the basilic vein. The child rallied, and was put to bed quite easy and comfortable, pulse 90, skin warm. The next morning the neck, cheeks, and tongue appeared swollen; these symptoms increased till about 1 P. M. He now refused to swallow, the pulse rose to 130, the pupils became again widely dilated, the extremities cold, and drowsiness constant. Injections into the vein were now made four times at intervals of a quarter of an hour each. The child improved very much; his colour returned; he could drink easily; the pupils were less dilated; he became quite sensible, now and again talking voluntarily to his mother. Dr. Bennett adds, "I felt quite satisfied, and left him for a couple of hours, during which time Dr. Keating saw him, and considered him very much better. Soon after 10-30 I found him greatly changed; pulse 160, very weak. I wished to inject again, but the mother would not allow it, and I have only to regret I did not enforce it." Soon afterwards the child died.

The 20th case is that of a child, six and a half years old, bitten by a snake at Dandenong, 19 miles from Melbourne. Before reaching Dr. Phillips,' at 3 P. M., neat brandy was given to him every five minutes, so that half a pint was consumed. On arriving, the pupils were widely dilated, the pulse very small, very irregular. There was great disposition to sleep, and great intolerance of the efforts either to awaken him or to give brandy; but a consciousness, when aroused, very different from a state of intoxication. Two ounces more brandy were given, but no improvement following, diluted ammonia was injected into the cephalic vein, and repeated. Not all of the ammonia passed directly into the vein, and the solution was of uncertain strength, none so strong as it should be. The child also lost some blood, as the vein was opened with a lancet. However, the child died, the *post mortem* examination revealing none of the ordinary appearances of snake-bite, but great congestion of the brain, which it is not improbable was caused by the brandy. Although in my opinion a case of snake-poison, it can scarcely be said to have been treated on my plan alone.

Of the foregoing twenty cases, three then have ended fatally, a child being in each case the sufferer.

In Dr. Langford's case, No. 8, twenty-seven hours had elapsed since the child had been bitten, and before he was brought to the hospital.

In Dr. Bennett's case, the child had apparently recovered from the coma, difficulty of swallowing, and collapse, under the treatment which, to the Doctor's regret, was stopped by the mother. We have seen in cases Nos. 11, 16, and 18, that the amount and strength of the ammonia must be increased in proportion to the severity of the case.

Case 20 was also a child, and possibly beyond any treatment; but cases 7 and 12 were also children of the ages of 9 and 12, and yet recovered.

Of the seventeen successful cases, it may be said that they would have recovered had nothing at all been done. No one can deny this; but I have been at the pains of inquiring of those who had charge of the patients, and this is their reply:—

Dr. Dempster believes the man would soon have died.

Drs. Arnold, A'Beckett, and Wooldridge, the same.

A similar opinion was expressed by Drs. O'Grady, Barnett, and Lane, Dr. Rae (of Bacchus Marsh), Dr. Rae (of Colac), Dr. Dowling, Mr. Eccles, Messrs. Henshall and Stillman, Dr. Langford, &c., of the cases attended by them.

I pass now to the consideration of the state of a person dangerously bitten by a snake, and to the effect of ammonia when injected into the circulation. And here, in addition to a mere statement of facts, I must pass into hypothesis.

In fatal cases of snake-poisoning, whether in this colony, India, America, or Africa, it may be stated, as a rule, with few exceptions, that the blood loses its power of coagulation, and becomes thinner and poorer; its colour resembling the most deoxidised form of Stok's cruorine. This blood, however, after death, greedily absorbs oxygen, when exposed to the air, and it absorbs it more than unpoisoned blood. Since my attention was first directed to this subject, I have met with Dr. Harley's observations on the influence of poisons on the respiratory gases. In a dog poisoned by a puff-adder, the blood absorbed two per cent. more of oxygen than healthy blood similarly treated. Now, as I asked in my first paper on this subject, why, when no impediment exists to the access of oxygen, should the blood become so gradually deoxodised in people bitten by snakes; excepting on the supposition that something had been added to the blood which prevented those actions and re-actions between blood and oxygen upon which the manifestations of life depend? The fluid state of the blood is also in harmony with deficient oxidation, and yet there is no hindrance to respiration; no reason, like in drowning, why oxygen should not reach the blood; it does reach, but in the presence of the serpent's poison, its life-sustaining power is withheld, unless some other agent be added to the blood to counteract it. The deficiency of fibrine and of oxygen I formerly explained on the supposition of the growth of foreign cells within the blood. I now modify that view, and explain the facts differently. The facts are still the same, but their interpretation different. The large cells are strangely altered, white corpuscles, greatly swollen, and certainly increased in quantity; the increase in size apparently keeping pace with the fluidity of the blood, although such changes do not occur in white corpuscles simply placed in water. This change in the corpuscles commences during life, but goes on indefinitely after death, until all the granular matter seen at first in the blood becomes converted into cells. Their average diameter is $\frac{1}{1700}$ inch. The nucleus is round, or kidney-shaped, and the outer cell-wall so extremely delicate as to escape the notice of most observers, until their attention is repeatedly directed to it; in addition, the application of magenta reveals a minute colored spot, like a ruby, at some part of the circumference, resembling the macula seen in the *red* corpuscles of all vertebrates, as pointed out by Roberts. But this condition of white cell is common to nearly all fluid blood of dogs and cats I have since examined. Where especially it is deficient in fibrine, the cells become very evident after death. But when the blood is rich in fibrine, the corpuscles, being less at liberty, retain their normal shapes. In fact, they swell in serum minus fibrine; on the contrary, in leucocythæmia, where both white cells and fibrine are in excess, these changes do not occur. (*See Appendix*).

I am still inclined, however, to refer all these changes in the blood to the introduction of germinal matter* from the serpent's glands, and all the symptoms to such changes. To explain: there is little, if any, difference, chemically, between starch and sugar; but, physically, they are very different; little difference, chemically, between fibrine and albumen; physically, they are very different. But both starch and fibrine are rendered soluble by the addition of minute particles of germinal matter: in the first case, from the salivary glands; in the second, from the stomach. True, with the latter is combined an acid, but without the pepsine cells no digestion takes place, and, what is very remarkable, a very minute quantity is able to convert a very large quantity of fibrine into albumen, so long as the mixture remains acid; the pepsine cells require no renewal, since, for want of a better explanation, they are said, by their mere presence, to determine the conversion. A little spittle from a man's mouth will change starch into sugar within one minute. These things being true, is it unreasonable to claim for the secretion of another closely allied gland to the salivary, an equal power in another direction? What the changes produced in the blood are we do not yet fully know; but that which in healthy blood is called fibrine is diminished, digested, if you will, in the presence of serpent's venom. If the quantity of venom entering the circulation is great, the changes are greater, and the chances of recovery less. If the animal is small, his chances are still less; if it depends much upon oxygen with a naturally highly fibrinous blood, rapid circulation and absorption, it soon falls a victim. Thus, a bitten bird falls in a few minutes from a twig to which it has hopped, to the waiting reptile beneath. Hence the old stories of snakes charming birds. If the animal be in a great degree indifferent to oxygen, *i. e.*, can live for a long time under water, in carbonic acid gas, as a reptile or hybernating animal, with correspondingly slow circulation and absorption, its chances of recovery are greater; it is naturally more indifferent to the presence of venom, and the probability of absorption from a wound is much less.

But, it may be said, the symptoms of snake-poisoning come on too soon for such changes in the blood to be produced; but recollect the nearly instantaneous action of ptyaline. Again, if venom enter a vein, one minute will certainly suffice for its entire circulation through the body. Estimating the quantity of blood in the body as 12 lbs., and the contents of the left ventricle as 3 ozs., then the whole mass of the blood would be circulated by 64 heart-beats; and, taking the normal beats at 75 per minute, this quantity of blood would pass through the heart, carrying with it the imported venom, in 51 seconds. In June 1866, I showed by experiments that dyes, such as magenta, may be absorbed from the serous cavities, peritoneum, and pleura, and from the subcutaneous connective tissue, and traverse the circulation, and be excreted by the kidneys, and ejected by the bladder, under five minutes. The experiments were made on dogs and fowls. Lately, Drs. Macnamara and Haughton have found iodine pass from the tunica vaginalis testis, and to be discharged by the bladder in four minutes; therefore, in man symptoms of poisoning may certainly be possible in five minutes, in birds in half that time.

Believing, then, that in the blood itself the chemical changes occur which have their resultants in voluntary and reflex acts (will, motion), and in animal heat, let us turn to the condition of our snake-bitten patient. He is usually pale, with a great tendency to sleep, the heart's action is feeble, and in some cases deep coma ensues, from which it is difficult to arouse him; in fact, the countenance is like that of an epileptic after the convulsion. Do not the pallor and drowsiness indicate an anæmic state of the brain, or rather a diminution of the arterial capacity and extension of the venous surface analogous to that which takes place in a less degree in ordinary sleep, according to the researches of Mr. Durham? In all of the cases brought before you this evening, the functions of the cerebral ganglia and higher sensorium were completely in abeyance, or for a time extinct. Dead the sufferers were to both sound and light, and to this hour they have no knowledge of the injections to which they were subjected. Now it is worthy of notice, that recent views ascribe the phenomenon of sleep to the using up of the previously stored-up oxygen in the blood, analogous to the views I propounded in June 1867, for the accession of sleep in cases of snake-poisoning.

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* The germinal matter consists of nuclei $\frac{1}{400}$ inch diameter. The fluid is either slightly acid or neutral.

There is yet another symptom of snake-poisoning, which deserves the greatest consideration; I allude to the condition of the pupil. It is that of extreme dilatation, depending, as I believe, upon the condition of the central optic ganglia. Light is pouring into the eye-ball, and yet no reflex acts are produced. An exactly similar condition affects the auditory ganglia, vibration after vibration shocks the tympanum, each falling silently upon the central ganglia.

Sometimes this condition of the sensory ganglia, including probably the corpora striata, optic thalami, and corpora quadrigemina, exists whilst the higher cerebral ganglia either remain a long time unaffected or escape entirely; in the latter case, recovery resulting; in the former, constituting a most dangerous state, and one that should make the physician very anxious, more especially when accompanied by swelling or pain in the neck. From the details of cases I have read, I should fear these symptoms more than the deepest coma. I was very pleased to see, however, that in Dr. Bennett's case, 19, the symptoms yielded to the injections of ammonia. Our esteemed fellow-citizen, Mr. Clement Hodgkinson, thus records in the *Herald* his own experiences, after having been bitten in New South Wales, showing the dullness, if such a term may be used, of the central, and immunity of the higher, ganglia. He says:—"There was insensibility to the effect of pungent salts when held to the nostrils, and to pinches inflicted on me by some of the lookers-on, who desired to thereby prevent me from falling into a comatose condition. There was also deprivation of sight. About two hours after I was bitten, this symptom attained its greatest intensity, and I was then scarcely able to distinguish the features of the persons near me." Mr. Hodgkinson, we all know, is no ordinary man, and I have no doubt his intellectual activity, or will, contributed to save him. Poor Mr. Drummond was conscious to the last, sight and feeling having been for some time deficient. His force of character contributed greatly to prolong his life. I may be better understood, if I contrast them with men of an opposite class. The Hindoos, with will so pliant, or character so impressible, as to be drawn into the mesmeric state with ease; bitten, they soon die, yielding without an effort to avoid their fate.

The treatment that I had recommended is that of injecting dilute ammonia, say, at the least, 30 minims of the liquor ammoniæ, B. P. sp. gr. ·959 into a superficial vein. If properly injected, the vein having been first exposed, and its coats pierced with the nozzle of the hypodermic syringe, the alkali soon reaches the heart, vigorous contractions follow, blood that was recently stagnating in the capillaries passes on, cut vessels, which had ceased bleeding, bleed afresh, the temperature rises, the colour improves, the muscles contract, the sensory ganglia respond to external impressions, the nearly or quite inanimate mass is now animate. Light and sound are perceived, the faces of friends are recognised. This is no exaggerated picture, but such as I have myself witnessed in dogs (the central organ being exposed, and artificial respiration kept for an hour) recovering instantly from the stupor of chloroform. I have also repeatedly pierced the heart itself, and there injected the ammonia, with similar good and no bad effects. I have witnessed the same restoration to consciousness in the station-master at Elsternwick (Case No. 2), and can call to your recollection the same startling assertions from all parts of the colony. Thus, Dr. Dempster's words are:—"It affected him at once; he woke up and became sensible." Dr. Barnett says:—"In a few minutes she began to recover from the stupor, and became so excited as to be held down on her bed." In Mr. Lane's case, verified by my friend Professor Wilson, the pupils began to contract, and consciousness returned in a few seconds, certainly under a minute. Dr. Rae, of Bacchus Marsh, assured me he thought his patient dying, and yet—not believing then in this remedy—he injected, and within a minute consciousness returned, and in about ten minutes the man walked into the open air unassisted. Dr. Longford says:—"Having used the injection three times without effect in the case of the boy Piggins, I used it in this case (No. 14) with the full expectation of failure, and was never more surprised than when I saw my collapsed patient rise up and walk away." Mr. Dallimore, writing to the *Age*, about Dr. Dowling's case, says:—"When I went to see the man while under treatment, I was quite as sceptical of the ammoniacal injection as the contributor to the *Medical Gazette* appears to be; but its action is so startling, I may say so magical, that if a man on seeing it could not be convinced, he must be singularly constituted." In Dr. Meyler's case, the woman being in a comatose state, was roused to consciousness in half a minute. Dr. Meyler has since written to me on this subject; his words are:—"The treatment in Mrs. Parker's case was not only decidedly successful, but exceeded my most anxious hopes, and finally removed any lurking doubts that may have lingered in my mind," and so on of others. But let us bestow the short time that is left, for the paper is already too long, upon considering the *modus operandi* of the remedy.

The remedy, then, is ammoniacal gas in solution, an old and favourite one for snake-bite the world over; but instead of putting it into a stomach, the stagnating vessels of which cannot absorb—for all the brandy and ammonia poor Mr. Drummond took were afterwards found in the stomach and intestines, and so no doubt of others—I inject it into the blood itself; the gas, experiencing a rise of temperature, expands, and presently is in direct contact with every tissue in the body, the capillary walls alone intervening—in fact, it becomes both a central and peripheral stimulus, so powerful that as yet no soporific tendency has counteracted it; none of the comatose states of snake-poisoning have failed to be removed by it; *but, as its power is expended, fresh supplies must be brought.* It does not act as a transitory stimulus to the heart, it maintains vigorous pulsations for at least twenty minutes or more, frequently requiring no repetition. Its presence in the nervous system and muscles is shown by the resulting animation; there is also a rise of temperature. It is presumable, therefore, that oxidation is going on in the blood, where before there was little or none; that the abnormal molecular changes going on in the blood are arrested; that electrical action results; and that the capillaries of the muscular system, the whole body over, are inducing to form heat or excite motion—the wheel of life is turning again, so lately on the point of stopping—for the muscles are now recognized as nothing but machines for the conversion of heat into motion; the determining and directing power residing in the nerve tissue; the fuel in the blood. It might be asked, Is it possible that the ammoniacal gas, under the influence of electric forces within the body, may be decomposed, that its hydrogen and the active oxygen in the blood may be condensed to form water? If so, the quantity of hydrogen contained in one half-drachm syringe would yield heat which, by transformation into muscular energy, would enable the patient to raise his own weight his own height. But, indeed, we know little of the molecular actions and re-actions taking place in living organisms, and it is difficult to say what is the destiny of ammonia thus introduced into the blood. But it is also as difficult to trace its functions in, and depositions from, the sap of plants; and yet we know that it stands in as important a relation to both plants and animals as heat itself. It is the source of all the nitrogenous elements of both, the re-actions between which and the external forces constitute life. Thus much, however, we can say, *viz.*, that just as the sounds emanating from a musical box are the result of a force communicated from without, so are the signs of animation proceeding from a patient previously insensible, as in these cases, the result of a force communicated from without, potential in the syringe, active in the body.

The lessons we have learnt from those who have used this remedy, and have sent their cases for publication to me, are that a good battle must sometimes be maintained ere recovery ensues. As with every other remedy, the amount required must depend, be judged of, by the effect produced; the great fear is that too little, rather than too much, will be injected. *The greatest care should be used that none of the ammonia is spilt, or sloughing will follow*; but if the canula of the syringe be properly introduced, and the injection be forcibly made, so as to mix the ammonia immediately with the blood, I believe none will follow. A little inflammation may result, but what of that if the patient be saved?

As symptoms of recovery instantaneously follow the use of ammonia in this way, we are saved the prolonged anxiety attending former treatments.

Objections have been made to the value of this treatment, on the supposition that Australian snakes are not venomous, or at least not dangerously so. Now, the cases brought forward to-night are a sufficient refutation of such errors. I find, from public records, that in some instances our snakes are as dangerous as those of India, and certainly quite as deadly as the rattlesnake. Thus, Underwood, a snake-charmer, was bitten at 7-30 P. M., and was dead by 8-3 P. M.; this is in one hour. Cartwright, another exhibitor of snakes, was bitten some time after 3 P. M; by 3-30 P. M. he was insensible, with fixed, dilated pupils, and at 4 o'clock was dead; that is, within one hour. One case has been communicated to me by Mr. Casey, Surgeon, of Melbourne, of death within half-an-hour. There are many cases on record of death considerably within twelve hours, and to live beyond twenty-four hours is rare—that is, when the case ends fatally. And, indeed, except in size and length of fangs and quantity of poison, the cobra differs little from our tiger-snake (*Hoplocephalus curtus*), which, like the cobra, erects itself, dilates the neck, and, in confinement or at bay, is very vicious. *Hoplocephalus superbus*, another beautiful species, is exceedingly dangerous. This is popularly called the diamond-snake, just as in many parts the tiger-snake is called the carpet-snake; but both the true diamond and carpet snakes are harmless. Next, we have the common brown-snake (*Diemenia superciliosa*), which, although it does not expand the neck like the cobra, is yet, according to Professor M'Coy, in size and structural affinity closely allied to it. The bite is very deadly. The black-snake (*Pseudechis porpyriacus*) is also very common in some parts and very deadly. It, according to Mr. Gerard Kreft, of Sydney, "raises about two feet of its body off the ground, flattens out the neck like a cobra, and then darts at its prey or enemy." The same authority states that animals, such as dogs and goats, die usually within one hour from the bite of any of the above species. I have experimented chiefly with the tiger-snake (*Hoplocephalus curtus*) and have obtained the same results; but in one instance one of my tiger-snakes killed a dog in seven minutes. I have inoculated with the poison of all but the black-snake, and find them equally deadly.

Further, I feel certain, from my own actual experiments, that equal amounts of poison from either American, Indian, or Australian snakes are equally pernicious, if introduced into the blood. Thanks to Dr. Weir Mitchell, of Philadelphia, whose essay* should be read by all students of this subject; I have examined minutely rattlesnake poison. I find tiger-snake poison exactly like it, acting similarly in the presence of the following agents, *viz.*, nitric acid, hydrochloric acid, sulphuric acid, acetic acid, tannic acid, ammonia, and alcohol. Both cobra and rattlesnake poisons act similarly on the blood; the same fluidity results, with the same *post mortem* production of multitudes of large and maculated white cells. This I have repeatedly verified; and if others cannot see these enlarged cells, it is no fault of mine. I have shown them to many who could not see them, while they were all the time under their eye, and yet many were good microscopists. I find also that, by inoculation, dogs die as rapidly from tiger-snake poison as from either of the other two; but the local symptoms are from the cobra and rattlesnake bites severer than from that of our Australian snakes. The general symptoms, however, are the same. Of the man bitten a few years past by a large cobra in Melbourne, Mr. Fitzgerald says:—"Five hours after the accident, I found him in a state of stupor; pupils dilated; the extremities and body were colder than natural; the power of speech was lost." Now, these are the symptoms of nearly all the cases detailed this evening, which symptoms were dissipated immediately on the injection of ammonia. I do not say they will be similarly dissipated in *every case* of cobra poisoning, or even of tiger-snake poisoning; but in the majority of cases it may be expected that they will, for what has happened seventeen times in Victoria, may certainly happen as many times again, or oftener, in India or in America. As yet I have seen no account of the injection of ammonia into the veins of men in India. In London, Dr. Tyler Smith used it with the best effects in puerperal fever (blood-poisoning).

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* "Researches upon the Poison of the Rattlesnake"—Smithsonian Contributions to Knowledge, vol. xii.

Such, Sir, are the observations I have found it my duty to address to this Society. Much more I might have said, but I have limited myself principally to a detail of cases which, I believe, cannot be controverted; and I have to thank those gentlemen who have so kindly and fully communicated to me facts upon which this paper is based, and I sincerely hope, when this is read by them in their scattered and isolated districts, it may be to them a satisfaction.

In the discussion which followed,

The President said, that, for some reason or other, Professor Halford had scarcely alluded to the article in the *Lancet*, in reply to which, as they had been informed by circular, he had prepared his paper. He, the President, nevertheless, considered it his duty to make a few remarks in reference to the unjust manner in which Professor Halford had been treated by the leading medical journal of England. He was, indeed, unable to understand how a scientific organ of such standing as the *Lancet* should have admitted into its columns statements which it must have known, or ought to have known, to have been untrue from the beginning to end. The Professor was accused of having taken credit for two discoveries, one of which, *viz.*, ammonia, as an antidote to snake-bite, was no discovery at all, and the other of which (the method of treatment by injection) was one of the oldest methods of therapeutics. Professor Halford, however, had never asserted that ammonia was an antidote in snake-poisoning, in a chemical sense of the word, but he simply argued that, if ammonia had really a beneficial effect in these cases when taken by the mouth, as had been generally assumed, it would exert its influence upon the system much more quickly, and in a much higher degree, when introduced directly into the circulation. He, consequently, instituted a series of experiments on animals, and it was on the strength of the satisfactory results he obtained that a number of independent medical men, whose veracity nobody had a right to doubt, injected ammonia into the veins of patients suffering from snake-bite. Every one, without prejudice, who read the cases as reported by these gentlemen, could but arrive at the one conclusion, that in most of the cases life had been saved through the agency of the ammonia injections. They knew very well that transfusion of blood had been practised occasionally, and that water containing the saline constituents of the blood had been injected in cholera; but, hitherto, it was always understood that the injection of remedies directly into the circulation was fraught with the greatest danger. He, the President, was not aware that, previous to Professor Halford's experiments, ammonia had ever been injected into the veins of the human subject; that this, however, could be done not only with impunity, but in poisoning from the bite of snakes indigenous to these colonies, with most favourable results, was a fact for the knowledge of which society was indebted to Professor Halford. In the case of prussic acid poisoning, moreover, which occurred the previous week, the remarkable effect of the ammonia, although injected only a considerable time after the poison had been taken, strongly pointed to this mode of treatment in all those cases of poisoning in which stimulants were indicated.

Mr. Lane said,—It is not my intention, Mr. President, to make any remarks on the nature of the action of ammonia when injected into the circulation.

Nevertheless, as one of the cases of snake-poisoning mentioned in Professor Halford's paper came under my care for treatment, I may be permitted to state to this Society a few particulars respecting it.

When brought to my house, four hours after the injury, the boy was completely insensible to the almost brutal treatment of his attendants. He was placed on a sofa in this insensible condition. The eyes were fixed, and the pupils considerably dilated. Two punctures were visible in the left leg, from each of which blood had been oozing. I now injected ten minims of the liquor ammoniæ fort., mixed with twenty of water. In ten minutes he answered questions, and in half-an-hour he walked into an adjoining room, and completely recovered.

Now, Sir, I can well understand that persons not belonging to the profession, on seeing a man dying (as they supposed), and in ten minutes hearing that man answer questions when put to him, and in another twenty minutes walking into an adjoining room, may well be excused if they stagger at their previous belief in the existence of the bite. But, on the other hand, when members of the medical profession (men trained to recognize symptoms and to attach to them their value), after witnessing such a condition, and seeing for themselves the subsequent effective restoration by the injected ammonia, deny and denounce its efficiency, I simply should doubt their veracity; for I should consider that they were influenced by premeditated prejudice or determined obstinacy.

Dr. Thomas said that Professor Halford had adduced a sufficient number of cases to establish the fact that ammonia may be injected into the veins of man and the lower animals with impunity, and, in cases of snake-bite, with the advantage of saving life. Transfusion, we all knew, was not new; no one pretended it was so—it had been practised for ages. He (Dr. T.) had, some twenty-five years ago, performed it in the case of a lady who was sinking from hæmorrhage. Some blood of an attendant was injected into the patient's vein. She rallied for a short time, but expired before the lapse of many hours.

Nearly all the cases recorded by Professor Halford were those of patients under the care of different medical men, living far and in opposite directions from each other. The results of the injection were in each case of great similarity, and were of great value. Such testimony was not that of a man "riding his hobby," but of a number of skilled, intelligent practitioners.

He was glad that Professor Halford was now of opinion that the globules, which he formerly considered as foreign cells, were white blood-corpuscles, altered in size according to the density of the fluid in which they floated. That was his (Dr. T.'s) opinion when he first examined the blood of dogs which had died from snake-poison, and he expressed it at the meeting of the Royal Society, when the Professor read his first paper on the subject.

There was one remark he should wish to make. It seemed to him that snakes were more numerous now, and their bite more fatal, than they were many years ago; for during his practice, extending from 1839 to 1852, which was very extensive, he was not aware, at the very outside, of more than half-a-dozen cases, and not one had a fatal termination. The few whom he attended, he recommended stiff and frequent doses of brandy until intoxication was induced. Could the increase be attributed to the extinction of the black race, and the disappearance of the laughing-jackass from the populated districts.

He, for one, was not aware that ammonia had been injected into the veins before the Professor had done so, and he thought that great credit was due to Professor Halford for having instituted a theory which so many medical men had reduced so successfully into practice. Soubeiran, in 1832, discovered chloroform, but Professor Simpson discovered its anæsthetic properties. Ammonia had long ago been discovered, but only Professor Halford found out that it could be injected into the blood, and that, when so applied, it counteracted the effects of snake-poisoning. Simpson everywhere ranked as a discoverer, and so must Halford.

Dr. McMillan remarked that, during the reading of this interesting paper, he had been struck by the remarkable degree of *uniformity* in the results obtained by the injection of ammonia into the veins in cases of snake-bite; and he considered that this circumstance alone enhanced the value of the testimony, and should go far to convince, even the most sceptical, as to the efficacy of this remedy when applied in the manner proposed by Dr. Halford. Dr. McMillan further remarked that, in connection with this subject, it might be well to estimate more accurately the therapeutic value of alcoholic stimulants when exhibited as a remedy in snake-bite. It had been shown by Dr. Halford that when the circulation was languid, and the nervous system prostrated by the shock, that alcoholic fluids were not absorbed, but that they remained accumulated in the stomach and intestines. Hitherto, people had been accustomed to trust very much to stimulants of this class; and if it could be shown that they possessed comparatively little value in arresting the fatal tendency of the snake virus, it might lead to a more prompt and general adoption of that which had alone proved worthy of confidence as a remedy in snake-bite. We all remembered that in our class-teachings on this subject, much stress used to be laid on the importance of *topical* treatment. We were told to excise the part; to make an incision, and cause the current of blood to flow outwards, that it might carry the poison with it. We were even told that we might apply our mouths and suck the part; with the same end in view, to apply ammonia to the wound, nitrate of silver, &c. It appeared, however, from the evidence adduced in this paper, as well as from the numerous experiments made by Professor Halford, that the poison entered the current of the circulation with such rapidity as to render all local treatment vain and useless.

In reply, Professor **Halford** stated that he could not enter into controversy with anonymous writers who were either untruthful or ignorant. He had neither the time nor the inclination to do so. The subject was one in which no disguise was required. A great series of experiments on apparently dying people had been done all over the colony at his suggestion, and with remarkable success. He had felt all this time on his trial; for had the results been different—had death in any one case been attributable to the injection of ammonia—there would not have been wanting those to upbraid him. Nothing but a continued series of experiments had led him to suggest this treatment, and he had done it conscientiously, and, therefore, fearlessly; at the same time, he was aware that it had struck the majority of medical men as a most dangerous and unwarrantable proceeding. To throw into a vein a fluid too caustic to spill upon the tissues or put into the mouth seemed madness. He had never said that ammonia destroyed the poison; on the contrary, he had long ago stated in the *Argus* that, when the strongest ammonia was added to snake-poison, and the mixture injected beneath the skin of a dog, all the symptoms of snake-poisoning resulted as regularly as if the poison had been untouched. Dr. Weir Mitchell had previously found the same to be true of the poison of a rattlesnake.

As regarded the exhibition of spirits, he did not believe that, when the dose of poison was large, they *could* act beneficially. They were either rejected, *i. e.*, vomited, or, on account of the depressed condition of the circulation, not absorbed. He had heard many say, "Give spirits so as to make the patient drunk; if you can do this, he is saved; if you cannot, he will die." To his mind, this proved that, in the case of patients getting drunk, the spirits were absorbed, and therefore the cases not so dangerous from the commencement, and doubtless the spirits were beneficial. But when the patient could not be made drunk, the original danger was greater, and no absorption of the spirits took place. It had been in such cases that the injection of ammonia was so serviceable, urging on the stagnating streams of life, and leading to recovery. Dr. McMillan had somewhat misunderstood him as to the value of excision. True, if the poison had entered the circulation, little or no good could result from local treatment; but in the majority of cases, time elapsed before the virus entered the blood, for all punctures were not directly into the veins. Therefore, in all cases, cut out the part at once, rather than neglect it. A glance at Dr. Dowling's case, and at many others which were recorded, would show this. He said, "Don't give the poison a chance; if possible, get rid of it at once, rather than fight it afterwards with ammonia or any other remedy." This was clearly our duty.

In conclusion, he hoped the profession would remember what he had recorded in the *Medical Journal* of last November, *viz*, the facility and safety with which the iodide and bromide of ammonium and drachm doses of sulphurous acid could be thrown directly into the veins. He had also injected as much as four grains of pure carbolic acid, dissolved in thirty drops of glycerine, into the blood of dogs, and repeated it several times. Each injection was followed by clonic spasms, severe or mild, in proportion to the dose used, but soon passing off, and perfect health remaining. Those who believe in the germs of disease being in the blood, and that carbolic or sulphurous acid could destroy them, might think over these facts.

DR. AUBREY BOWEN, in proposing a vote of thanks, remarked that Dr. Halford, in defending himself from the unfair and somewhat personal attack made upon him in the *Lancet*, was not only doing so for himself, but for by far the greater part of the medical profession in Victoria, who had in a very marked manner concurred in giving due credit to Dr. Halford's exertions; and he considered that in recapitulating and reviewing his experiments on the influence of the direct injection of ammonia into the veins, he had most satisfactorily refuted the aspersions cast upon him.

APPENDIX.

Further Observations on Snake-poisoning. By GEORGE B. HALFORD, M. D., *Professor of Anatomy, Physiology, and Pathology in the Univerciy of Melbourne.*

[Read before the Royal Society of Victoria, 27th August 1868.]

In former papers communicated to this Society, I have dwelt particularly on the vast numbers of white cells seen in the blood after death from snake-poison. Subsequent and repeated observations have confirmed my original description equally of the growth, size, and maculated condition under the influence of magenta of these bodies; but lately my friend, Mr. Ralph, Surgeon of Kew, near Melbourne, has discovered a nearly similar condition of blood in animals poisoned by prussic acid. I have confirmed his observations, and most probably such bodies will be found, and arise, wherever after death coagulation of the blood does not take place. The whole subject, therefore, requires re-consideration. The facts are as I stated, but possibly have relations hitherto unknown to me.

From the first I stated these white cells arise in a structureless molecular matter, nucleus first, cell-wall after; and that in some manner they took the place of what is called fibrine; and, further, that the higher the thermometer for the time being, the more numerous and larger were these bodies.

The changes, therefore, take place when the blood is stagnant, but still retained within the veins.

Now, it is fortunate that I can direct the attention of this Society to some other phenomena in the growth of cells, as observed by Dr. Onimus and recorded in the *Journal de l'Anatomie et de la Physiologie*, 1867, and just received in Melbourne. He disbelieves in the doctrine of Virchow that *omnis cellulaé cellulá*, and holds that *cells arise in an amorphous blastema.*

This agreeing with the origin of the white cells I have described, let us follow Dr. Onimus in his experiments and conclusions.

The fluid from a recent blister was filtered so as to obtain a fluid containing no kind of form, neither white corpuscles nor epithelial scales. This fluid was enclosed in small tubes of goldbeater's-skin, and placed beneath the skin of a live rabbit.

After 2 hours—the serum was still transparent, although it had lost its primitive citrine colour. In it were seen a few white cells and granules.

After 24 hours—the serum was turbid, and contained a great quantity of white cells and granules.

After 36 hours—the serum was quite white, milky, and composed entirely of white cells and granules; the white cells having all the characteristics of white corpuscles of the blood.

Increase of animal temperature aided the production of the white cells.

No white cells nor any sort of anatomical element was formed in the serum of blisters, from which the fibrine had coagulated.

The presence of white cells artificially added to serum from which the fibrine had separated, had no effect in causing further development of white cells.

It is certain, therefore, there is some relation between the growth of white cells and those elements which by their separation from the liquor sanguinis constitute fibrine.

It will be remembered that I referred all the morbific agency to the microscopic germinal matter found in snake-venom, and not to any fully formed cells. Dr. Onimus observes that in infectious diseases, miasmatic or virulent changes are not found on the side of elements having form, but in the composition and properties of the plasma. The white cells of the virulent pus of a chancre resemble those from a healthy sore; it is in the serum that search must be made for the difference in the properties of the two prudent fluids.

It is, however, possible that with increased microscopic power, and more time for such labors, modifications of form and property may even be recognised in the molecular matter of serum.

Now, it has been maintained by some, and by Dr. Weir Mitchell, of Philadelphia, whose writings on snake-poisoning deserve, and have my willing respect, that nothing like germinal matter exists in snake venom. I cannot agree with him.

But I have always stated it exists in a very microscopic form, and that to this minute elementary germinal matter the activity of the venom is due. Since this was stated by me, similar conclusions have been arrived at by M. Chauveau (*Comtes Rendus*, 1868), of the nature of the vaccine virus, which he describes as consisting of—*first*, the serum, an albuminous fluid, holding the various soluble substances in solution; and, *secondly*, the solid elements, consisting of white cells and of elementary granules, both of which are suspended in the serum.

After separating the white cells, the remainder was as virulent as ever, and the clear serum was found to be harmless; but in the elementary granular matter dwelt the activity of the virus.

I hope this short and imperfect communication may induce others to think on the correlation of the animal poisons.

Experiments performed with the assistance of DRS. NEILD *and* WOOLDRIDGE, *to show the action of ammonia upon the central organ, and that it may not only be injected into the veins, but into the heart itself, without injurious effects, and also that it counteracts in a most powerful manner the lethal influence of chloroform.*

EXPERIMENT I.

A large young dog was got under the influence of chloroform; the front of the chest was removed, and artificial respiration maintained, chloroform being occasionally dropped into the bellows.

11-27 A. M.—Half a drachm of liq. ammoniæ B. P. sp. gr. 0·959 was injected into the left external jugular vein. The heart's action was at once accelerated, but soon settled down to steady pulsations.

11-35 A. M.—Half a drachm more was injected into the right ventricle. Immediate increase of the heart's action ensued. Consciousness returning, as evidenced by the reflex movements of the eye-lids, and by a withdrawing of the leg on pricking the foot. Pulsation powerful and steady.

11-45 A M —Completely conscious, struggling to get up. More chloroform was poured into the bellows. Soon became insensible again.

11-50 A M.—Half a drachm was injected into the left ventricle. This was almost immediately followed by a contraction of all the muscles of the body, which soon subsided. Heart's pulsation very vigorous.

11-53 A. M.—Dog returning to consciousness; more chloroform poured into the bellows. Soon again insensible.

12 noon.—Half a drachm more injected into the left ventricle. The same increased pulsation, followed by slight universal spasm as before.

12-2 P. M.—Dog quite conscious and struggling; more chloroform poured into the bellows.

12-11 P. M.—Dog again conscious and struggling; more chloroform poured into the bellows.

12-13 P. M.—Again quite insensible, pupils dilated, &c.

12-17 P. M.—Half a drachm more ammonia was injected into the right ventricle. Heart pulsated forcibly, the same general spasm following.

12-22 P. M.—Dog again conscious; more chloroform by the bellows.

12-26 P. M.—The dog being again quite insensible, I injected half a drachm more into the right jugular vein. In ten seconds the heart's action was increased, the same general muscular spasm following. Sensibility returning as shown by the reflex acts of the eyelids, &c.

12-33 P. M.—Quite conscious and struggling to get up; more chloroform in the bellows; soon again insensible.

12-36 P. M.—Half a drachm more injected into the left ventricle. Pulsations immediately increased, followed by the same general spasm, but in a milder degree.

12-40 P. M.—Heart's action powerful and steady; pulsations good all over the body.

12-43 P. M.—Dog again quite conscious; more chloroform given; soon insensible.

12-48 P. M.—One whole drachm was injected into the left ventricle. Heart's action immediately quickened, followed by the general spasm. Reflex action of eyelids returning.

12-57 P. M.—Dog quite conscious, and struggling hard to get up, he seeming to have as much vitality as ever, and a sufficient trial having been made, the heart was cut out, and an end put to the experiment.

On examining the cavities of the heart, there was not the least trace of irritation or inflammation, and the punctures through the muscular substance were scarcely visible. The vigour and persistence of the heart's contractions after removal from the body were greater than I had ever before witnessed.

EXPERIMENT II.

Another large dog was chloroformed, the front of the chest removed, and artificial respiration maintained for one hour and twenty minutes, during which time the heart's movements were carefully observed. As in the former case, the injection of the ammonia had the effect of continually rousing the dog from the full influence of the chloroform, necessitating always a further supply of the anæsthetic before another quantity of ammonia was used. In this dog both jugular veins once, the right ventricle once, and the left ventricle three times were injected with half-drachm doses of liq. ammoniæ B. P. sp. gr. 0·959. The results were precisely similar to those noticed in the other dog, *viz.*, immediate increase of the heart's pulsations, settling down into steady beats. The same muscular spasms followed by returning consciousness, and, lastly, the same absence of any visible injury to the heart's cavities or walls.

On the injection of ammonia into the veins. By G. B. HALFORD, M. D., F. R. C. P., *Professor of Anatomy, Physiology, and Pathology in the Melbourne University.*

On Wednesday evening, April 7, 1869, I detailed to the Medical Society of Victoria the results of some experiments I had performed, with the assistance of Dr. Neild and Mr. Wooldridge, showing that within one hour and a half as much as four drachms and a half of the liq. ammoniæ B. P. sp. gr. ·959 might be injected into the veins, and even into the heart of dogs completely narcotised with chloroform, with the effect, at each injection of 30 minims, or even 60 minims, of restoring the animal to thorough consciousness and apparent original vigour. When the animals were subsequently killed, no injurious effect could be discovered in any organ of the body—the punctures into the ventricles even not being visible. I, therefore, suggested that in over-prolonged narcotism from chloroform, and in threatening syncope, the injection of ammonia might be used, in the case of syncope, by injecting into the external jugular, or with a proper instrument, into the heart itself

My detractors in this colony have seized hold of a statement made by Dr. B. W. Richardson, of London, in a lecture printed in the *Medical Times and Gazette* of July 1870, which is as follows:—" It has been hoped to neutralise the physiological action of chloroform by injection of antidotes into the veins. I tried the injection of ammonia into the veins as far back as the year 1854, and, although the injection excited the heart, it did not offer any material advantages."

I had duly read this on receiving our journals last October, and should have let it pass unnoticed, had it not been recently used against me. I am bound now to examine and comment upon it carefully.

Now, as Dr. Richardson and myself have ever been the best of friends, and as he has no greater admirer than I, it becomes me to deal with this sentence with the utmost care; and in doing so I shall quote his own words of 1858, and show that what he then believed, and what I too believed, of the effects of ammonia on animal life, was error; and that, so far as I can find, his experiments of injecting ammonia into the veins, to counteract poisoning by chloroform, have never been published, and I think must really have been forgotten by himself in 1858. I have never heard of them. It will be seen further on why I should have heard of them. But I did not, and that it is which perplexes me, and makes so contradictory his published words of 1858 and 1870, seeing that in 1858 there was an absolute necessity for his alluding to the subject. But, so far as I can find in his writings, he is silent on this point, having only used a small quantity of ammonia to retain the fluidity of the blood during the operation of transfusion. In the appendix to his work, *On the Cause of the Coagulation of the Blood*, page 440, he says: " In cases where danger arises from the administration of chloroform, I have seen the patient made to breathe ammonia vapour, not as a mere excitant to respiration (for in this sense it may be used legitimately with due care), but as a supposed general restorative. As the effects of ammonia in a large dose are, however, the same as those of chloroform in their leading particulars, the free introduction of ammonia into the narcotised patient is the addition of one volatile narcotic to another volatile narcotic."

Nothing is here mentioned, it will be seen, of injecting ammonia into the veins. When ammonia really enters the blood it is not a volatile narcotic at all. The fact is, the inhalation of the vapour of ammonia, except extremely diluted, is incompatible with life, not because it enters the blood, but from its interference with the necessary respiratory changes needed in that fluid. Its action, as a sudden poison when given by the mouth, is due to its deleterious effects on the tissues, and very probably through direct continuous stimulation of the peripheral twigs of the pneumogastric, causing the reflex opisthotonos mentioned by Dr. Richardson at page 113 of his work; for, most certainly, the dose that will produce death when given by the mouth will not produce it when thrown directly into the blood. Therefore, it must kill by its influences before it reaches the blood. This was the origin of my suggesting its direct administration in snake-poisoning, &c. It is the same in slow poisoning with ammonia; there are other elements to be considered besides the blood, which, the organs being healthy, is soon purified of any ammonia that may reach it. Of course, if, as at page 114, ammonia is given to a dog in doses of from five to twenty grains of the bicarbonate for upwards of a month, and for the last few days in increased frequency and dose, death will result, not from the presence of ammonia in the blood, but from impairment of function and destruction of tissues. The *post mortem* revealed it. I allude to these things because I wish my readers to understand the advantage that may result in some cases, by avoiding the ordinary portals to the blood-current, *viz.*, the lungs and stomach. Thus, seven-grain doses of carbolic acid, mixed with glycerine, I have thrown into the veins of dogs, this large dose being only followed by temporary clonic spasms, from which the animal soon recovers. Now, it would be impossible to give this by the mouth—it is an actual caustic. Again, more remarkable still, sulphurous acid cannot be given in any large dose by the mouth, and if given, most probably never reaches the blood, and yet, in the space of two hours, I have thrown as much as six fluid drachms of undiluted acid into the jugular and femoral veins of dogs, without causing the least distress. This may be regarded as a digression, but it very forcibly shows the advantage of the direct injection of certain remedies, as in the case of ammonia, over that by the mouth, and the different results that are produced.

I now proceed to extract entire, commencing at page 448 and ending at page 452 of the same work, the section which concerns me chiefly. I shall make no additions to, or subtractions from, it, merely introducing a few running remarks. The extract is headed in the work,—

Application of Ammonia to the Operation of Transfusion of Blood.

"Since the time when Lower first performed the experiment of transfusing the blood of one animal into the vessels of another (1866), and Denys, of Montpelier, gained unenviable notoriety for pushing this operation into practical operation with too much enthusiasm, it has been felt a difficulty in the steps of the operation to hold the drawn blood fluid for a time sufficiently long to secure its free transfusion into the animal body It is true that several ingenious instruments have been devised, which in some measure meet the difficulty, but not effectually. In this section I shall show that the cautious addition of ammonia to the drawn blood answers every practical purpose for sustaining fluidity, and for simplifying the operation.

"EXPERIMENT CCCCVII.—TRANSFUSION OF BLOOD.—On one occasion I had in my laboratory twenty ounces of sheep's blood held fluid by a solution of five grains of ammonia in a drachm of water. The blood had been kept fluid, for several hours, in a closely stoppered bottle. I had placed a dog under the influence of chloroform for an intended operation, when I perceived that the heart was stopping from the effect of the narcotic. I instantly laid open the external jugular vein, and blood escaped copiously; but, nevertheless, death took place. Prevented from following out the original operation, I thought it would be interesting to see how the sheep's blood would run in the vessels of this animal. I, therefore, warmed a portion of it to 98°, put a tube into the jugular vein, and injected four ounces with the greatest ease. I then laid bare the common carotid, and performed the same experiment with equal facility. The facility with which the operation was done suggested the plan of transfusing blood into a living animal after a similar manner. I have now performed this operation several times with excellent results. As examples, I shall give two representative experiments; the one showing the dangers which are to be avoided; the other, the operation as it may be safely practised.

"EXPERIMENT CCCCVIII.—TRANSFUSION OF BLOOD.—I laid bare the jugular vein of a healthy dog, and drew from it into an evaporating dish two ounces of blood, in which were four grains of ammonia, with a drachm of water. The blood was set aside for a brief interval. Next, I drew two other ounces of blood from the same vein into another evaporating dish, in which there was no ammonia, and set this aside that it might coagulate, the vein being meantime secured above the opening by a firm ligature. When the blood in the second cup had firmly coagulated, an event which occurred about four minutes after its abstraction, I drew into a two-ounce syringe the blood charged with ammonia, and which was still quite fluid, and introducing into the vein the nozzle of the syringe, threw in slowly the ammoniated blood. The syringe was withdrawn, and the vein was tied below the opening. For a few moments after the injection there was but little change; then suddenly the action of the heart became so bounding and intense that it seemed to heave up the chest-wall. Almost coincident with this, general tetanic spasms occurred, with rigid opisthotonos; and, in fine, symptoms so strictly analogous to those produced by strychnia, that the action of the two agents could not have been distinguished by a stranger ignorant of the cause of the symptoms. The chest was fixed, and death took place in four minutes. An hour after death the body was opened. The right side of the heart and the whole venous system were charged to distension with dark blood, which was perfectly fluid, and remained so for three hours on exposure to the air. In the left side there was also blood, of a bright red colour, and fluid. Set aside, this arterial blood coagulated in fifteen minutes on exposure to the air at a temperature of 70°. The corpuscles were very much modified. In this experiment, the first of a series on a living animal, the ammonia was added in a poisonous dose, and the results were strikingly marked. The analogy between the actions of ammonia and strychnia is so striking, when the former is thus thrown in excess into the circulation, that I cannot dwell too strongly on the fact, since it may have an ultimate bearing on the mode in which strychnia destroys life, and the means to be adopted in cases where this alkaloid is fatally administered. In an experiment in which Dr. Halford lent me his assistance, the same results were observed, under the same circumstances."

In this passage, written in 1858, we have Dr. Richardson's assertion, which at the time was assented to by myself, that four grains of ammonia,* mixed with two ounces of blood and slowly injected into the circulation, were as intensely poisonous as a similar quantity of strychnia. This, he says, is a point on which he cannot too strongly dwell. How much, then, did he inject into the veins, in 1854, to resuscitate in chloroform poisoning? This is, to me, the puzzling question. If he had injected four grains of carbonate of ammonia, dissolved in water, into the veins in 1854, he would not have found it produce death like strychnia, and not having found it, he would not have attributed the death in the experiment in 1858 to the ammonia, but sought for it in the manner of injecting the somewhat altered or altering blood into the heart. For I found, in 1868, very much to my astonishment at first, that four grains of carbonate of ammonia, in a sufficient quantity of water to just dissolve it, might be injected into the jugular vein of dogs without producing any injurious effect whatever. I have thrown ten grains into the veins in the space of five minutes without the least bad symptom following. But was it the liquor ammoniæ which Dr. Richardson used in 1854? Let us see how he speaks of this preparation in 1858.

"EXPERIMENT CCCCIX.—TRANSFUSION OF BLOOD.—I laid bare the jugular vein of a healthy terrier-dog, and drew off two ounces of blood into an evaporating dish, containing three minims of liquor ammoniæ, sp. gr. ·880, with thirty minims of water. Other two ounces of blood were drawn off into another dish containing no ammonia, and set aside to coagulate. The vein meantime was tied above the opening. After four minutes the blood in the second cup had firmly coagulated. The ammoniated blood was still completely fluid. After five minutes more had elapsed, the nozzle of the injecting syringe was introduced into the vein of the animal, and the ammoniated blood was injected. Dr. Halford, who managed the syringe, took great care to introduce the syringe slowly, and a full quarter of an hour was taken up in this way. Then the syringe was withdrawn, and the vein was tied beneath the opening. In the course of this operation, not a dangerous symptom supervened. The blood ran easily. As it first reached the heart, that organ, which had been flagging, beat with a little more force, and sustained this activity without abnormal increase. The animal recovered without the slightest indication of injury, and it is alive and well now.

"A small portion of the ammoniated blood left in the evaporating dish was observed to coagulate thirty-five minutes after the blood was first drawn; it formed into a firm clot. The temperature of the day was 75° Fah.

"In performing the operation of transfusion by this simple means in the human subject, in the extreme cases adapted to the operation, a few precautions are required. The amount of ammonia, first added to the blood about to be transfused, should not exceed two minims of the stronger liquor ammoniæ to the ounce of blood; for it is quite easy, if a diluted solution of the ammonia be ready at hand, to add a little more in course of operation if the blood should show a tendency to coagulate. The ammonia diluted with water, in the proportion of one part of the alkali to ten of water, should be placed in the vessel in which the blood is caught from the vein; and the blood as it falls into the vessel should at first be very gently stirred. When sufficient blood is obtained, and the injecting syringe is at work, the injection should be made with the greatest care and slowness. Indeed, scarcely any pressure on the piston is required, and there is no cause for haste. This is a great advantage, for I take it, one of the dangers of transfusion is the rapid distension of an empty and enfeebled heart with a full charge of blood. Harvey, whose shrewdness seems to have let nothing in his way escape observation, refers to the syncope which sometimes occurs in bleeding, not as a result of the hæmorrhage, but on the removal of the fillet: or, as the vulgar say, 'from the turning of the blood.' Harvey thought that this occurred from the coldness of the blood, which retreated on the heart, but I think that I have demonstrated by experiment in another place, that the effect is due to the sudden load of blood thrown upon the enfeebled organ.

"With these precautions the operation of transfusion, by the process I have described, is at once as simple as it is effectual; and in sinking from loss of blood it has this advantage, that to the new charge of blood there is added an agent having the property of stimulating the flagging heart into renewed force and activity."

I have thus extracted all that Dr. Richardson has said on this subject, and I now ask, if he thus feared the introduction of any more than two or three drops of liquor ammoniæ into the circulation in 1858, how much did he use in 1854 in attempting to resuscitate from chloroform. He could not have used more than three or four drops, or he would not have thus feared this quantity in 1858. For assuredly had he used this quantity, or more, he would have given benefit rather than have done harm. Liquor ammoniæ is not the strychnoid poison that he imagined it was in 1858, and he would have known this in 1854 if he had used it at that date to restore from chloroform. I have thrown repeatedly from ten to twenty minims into the veins of dogs without harm; and the human subject has been pretty freely injected with it in this colony. Thus, of the same preparation, *viz.*, the liquor ammoniæ fortior. sp. gr. ·880,

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[*] It was the carbonate of ammonia.—G. B. H.

Drs. Jackson and Cotter injected twenty-five minims within an hour or so, with recovery from the syncope and vomiting of snake-poisoning.

Mr. Gillbee used forty minims in a case of narcotism and syncope from chloroform poisoning, with the effect of restoring the man to consciousness and to his home, where he lived thirty-two hours, and then succumbed to an attack of *delirium tremens*, from which his liquor-steeped body never recovered. In this case nothing but good symptoms followed each injection.

Dr. Dowling injected sixty minims in a severe case of snake-poisoning, and heroically saved his man.

Therefore, if Dr. Richardson was so fearful of a few drops in 1858, could he have used it to restore from chloroform, as he says, in 1854? I think he must be making a mistake, deceiving himself in fact. I beg of him, if he have the notes of the experiments by him, to publish them. At any rate, the statement made in his lecture in 1870 is apparently so contradicted by his written words of 1858, and by all that I remember, as to need some explanation. Nothing in Dr Richardson's work, or in his edition of Snow's work on chloroform, that I can find, suggests the injection of ammonia for any purpose, the only use he made of it being to hold the blood fluid, at the same time regarding it as a poison analogous to strychnia.

Dr. Fayrer, who was consulted on the subject by the Government of Bengal, observed as follows :—

"I have repeatedly tested the efficacy of liquor ammonia used hypodermically with the view of counteracting the action of the virus of the deadly snakes of India on the lower animals, and that the result has been to show that it has no power of saving life.

Snakebites are of different degrees of severity, and represents the inoculation of varying quantities of the virus according to circumstances. A large number of those bitten recovers, and of these the recovery may, no doubt, be aided by medical treatment, and probably ammonia is one of the most useful therapeutic agents for the purpose, and as such I advocate its administration.

In the more severe cases (and there are probably over 20,000 deaths from such annually in India), where a vigorous snake, say a cobra, has *fully* inoculated its poison, I fear all drugs are alike impotent. I am unable to believe, from anything I have yet seen, that an antidote, as the word is conventionally understood, is, or is likely to be, known.

I have read Dr. Halford's views and experiments with much interest as those of a man well-known to science, and I regret that I have been unable to arrive at similar conclusions with reference to the hypodermic injections of ammonia.

My views, so far as they go, are derived from actual experiments carefully and repeatedly performed on animals, with the aid of men well qualified to form opinion or detect errors in what they saw. The conclusions arrived at are recorded in the enclosed pamphlets, which I beg you will submit for His Honor's perusal. As yet I have seen no reason for modifying them.

I have had no opportunity of testing the efficacy of ammonia hypodermically injected in human beings, badly bitten by deadly snakes; but I see no reason for supposing that it would be more efficacious in man in *really severe* bites than in the lower mammalia, on whom the effects of the poison are similar."

SUMMARY OF EXPERIMENTS ON THE INFLUENCE OF SNAKE POISON.

By J. Fayrer, M. D., C. S. I.

(Re-published from the Indian Medical Gazette.)

The experiments, of which this is a summary, were commenced in October 1867, and have been continued as regularly since, at such intervals, as time and other and more important avocations permitted. My object has been to determine by actual observation the effect on life of the poison of the venomous snakes of this country, and to test the value of remedies, whether internal or external.

So many absurd ideas on the subject prevail that it is desirable to know the real truth, not less with reference to the actual *modus operandi* of the poison, than to the value of the many vaunted antidotes. The results, I regret to say, tend to show that, in the present state of our knowledge, we can do little to counteract or neutralize the action of the poison; but what may be expected from treatment I have endeavoured to show.

As to antidotes, I could speak with reserve on the subject of possible future discoveries; my experience does not encourage me to hope that we shall discover anything that can be regarded as an antidote, such as is generally meant by that term. But, considering the imperfection of our knowledge on this and kindred subjects, I would do nought to deter or discourage others from further investigation.

My personal experience is derived from the action of the poison in the lower animals, and a few cases in man; the antagonism of the venom to the vital forces is shown in one as well as in the other, and is no doubt subject to the same laws. The deductions from one are applicable to the other.

The greatest care has been observed in all the experiments, and most of them have been often repeated to exclude, as far as possible, sources of error, and to obviate generalization from insufficient data.

Almost every experiment has been witnessed by competent observers, to whom I am much indebted for their assistance, and for the additional value which their presence attaches to the validity of what was done.

The object of investigation has been the simple truth. I can safely say there was neither foregone conclusion to maintain, nor theory either to support or oppose.

The snakes with which the experiments have been conducted were—

The varieties of Naja Tripudians or Cobra.
The Ophiophagus Elaps or Hamadryad.
The Bungarus Fasciatus or Sankni.
The Bungarus Cœruleus or Krait.
Some of the Hydrophidæ.
The Daboia Russelli.
The Echis Carinata.
The Trimeresurus Monticola.

And in the case of the Calophides and the other Crotalidæ, I have referred to the experiments of others, not having had opportunity of testing them myself.

The living creatures experimented on have been the ox, horse, goat, pig, dog, cat, civet, mongoose, rabbit, rat, fowls, kites, herons, fish, innocent snakes, poisonous snakes, lizards, frogs, toads, snails.

The symptoms produced by the poison both constitutionally and locally have been carefully noted. The state of the blood has also been examined, specially with reference to structural changes—and for this part of the investigation I have been much indebted to Professors Partridge, Ewart, W. Palmer, J. Anderson, and Dr. Douglas Cunningham.

In point of relative deadliness I should be inclined to consider that the cobra, ophiophagus, and daboia are very nearly on a par. They are quite capable of destroying a full grown dog in half an hour, sometimes in much less time; and very frequently I believe man has succumbed within an equally short period, though generally the time is much longer.

The bungarus cœruleus is, I believe, just as deadly, but apparently does not kill quite so quickly. The bungarus fasciatus is less fatal, and kills less quickly than the bungarus cœruleus. The echis, if one may credit the reports from Scinde, and they are confirmed, to a certain extent, by Major MacMahon, Deputy Commissioner of Delhi, is also a very deadly snake. It destroys life rapidly in small animals; but from its small size, it is perhaps less likely to be fatal to man, though from what I have seen of the effects of its poison on pigeons, fowls, and dogs, I should regard it with peculiar dread.

Of the hydrophidæ less is known; but the few experiments I have performed, and those by Mr. Stewart, prove that they are very fatal, and I should think human life would be in great danger from their bite.

The calophides and crotalidæ of Hindustan are certainly not so deadly as those I have mentioned, and though capable of inflicting a painful and, in some instances, no doubt, a dangerous bite, they are not so much dreaded as the other snakes.

There are differences in the symptoms produced by the poisonous bites of the different thanatophidia, but none of any great physiological or pathological import. In some cases convulsions are more marked, and in others death is preceded by a more marked appearance of lethargy. In some, as in those of the echis, the local symptoms are peculiarly severe; in others less so. But the differences are more of degree than of kind. They all point to exhaustion and paralysis of the nerve centres—the sources of the origin of vital force—every function fails rapidly, and vitality is soon extinct.

Local paralysis of the bitten part, great depression, faintness, exhaustion, nausea, vomitting, hæmorrhage, relaxation of the sphincters, involuntary evacuation, not unfrequently of a sanguineous or muco-sanguineous character, precede the complete loss of consciousness, and after this convulsions occur just before life ceases.

The *post-mortem* appearances frequently reveal simply nothing except the marks of the fangs and the slight ecchymosis about them; or if the creature have survived some hours, infiltration, and, perhaps, incipient decomposition of the tissues. The lungs are not generally congested, the heart is not generally overloaded, the viscera look natural enough, death is not traceable to special disturbance of any one great function, such as respiration, and the blood, after death, in the cases of the lower animals, certainly, and if in them, why not in man,* nearly always coagulates firmly on removal from the body, after death, from poisoning by the calubrine snakes. But in death by viper poisoning it remains permanently fluid. The cause of this I am quite unable to explain, but there can be no doubt of the facts as regards the lower animals, for they have been proved by often repeated experiments.

From experiment, I have arrived at the following conclusions.—Snake poison acts with most vigor on the warm-blooded animals; birds succumb very rapidly; a vigorous snake can destroy a fowl in a few seconds.

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* It is to be noted that in most recorded *post-mortem* examinations of human beings, who have died from snake bite (whether colubrine or viperine), the blood is noted to have remained fluid after death. I cannot reconcile this with the condition of the blood in animals, which is, as I have stated, coagulable after death, from colubrine poisoning, found after death, from viperine poisoning. Further examination is needed.

The power of resistance is generally in relation to the size of the animal, though not altogether so; cats, for example, resist the influence of the poison almost as long as dogs three or four times their size.

The cold-blooded animals also succumb to the poison, but less rapidly. Fish non-venomous snakes, mollusca, all die. So far as I can decide from experience the poisonous snakes are not affected by their own poison, *i. e.*, a cobra may bite itself, or another cobra, and with no evil result.

The less are probably affected by the more poisonous snakes, *e. g.*, the bungarus seem to be affected by cobra poison, though slowly.

It is possible that they can all to some extent affect each other, though infinitely less than other animals. In many of the various experiments I have performed, the cobra, daboia, and krait did not appear to be able to poison themselves or each other. Some of the experiments render this doubtful, and seem to show that a cobra or daboia may poison a krait, or *vice versâ*, but that they escape more frequently than they suffer.

Snake poison is absorbed through delicate membranes. It is deadly when applied to a mucous or serous membrane, to the stomach, or the conjunctiva. The idea that it is only capable of absorption by direct injection into the blood is erroneous.

The blood of animals poisoned to death by the colubrine snakes coagulates after death. That of animals poisoned by the viperidæ remains permanently fluid.

The bodies of animals poisoned by snakes are eaten with impunity by man and animals. I have had repeated proofs of this. The fowls and pigeons killed in my experiments were always taken away and eaten by the sweepers who were present, and who sought them greedily. They were not unfrequently given to dogs or cats; no harm followed.

The blood of an animal dead from snake poisoning is itself poisonous; if injected into another animal, it destroys life. This shews the intensity of the poison; a drop or two diluted with the blood of a fowl or animal renders the whole poisonous. Venomous snakes, though not at all, or very slightly, affected by snake poison, are very susceptible to other poisons, such as strychnine or carbolic acid. The latter destroys them very rapidly, and they seem to regard it with peculiar aversion. Poisonous snakes are not, as a general rule, very aggressive, except perhaps the echis. They seek to be left in quiet, to be let alone. They bite only if disturbed or irritated, and even then they often will not bite, but make one or two strikes at the enemy as if to frighten it.

In my experiments, I had always the greatest difficulty to get the cobra, krait, or daboia to bite voluntarily. An animal may remain in a cage or box with a cobra or daboia a very long time before it is injured, and perhaps, after all, it is taken out untouched, even after trampling on and bruising the snake, in its efforts to escape from its enemy, which is as much frightened as itself. There is much hissing and demonstration of attack, but frequently nothing done. If pressed and overteazed, they bite at last, and if they insert their fangs and retain their hold, the bite is generally fatal.

The echis, however, will strike and mortally wound a fowl or small animal directly it approaches it, and its dart is so rapid that it is scarcely seen.

Snakes frequently strike and even wound without poisoning, or very slightly so. The fang merely scratches and makes a tear, but if inserted and retained for a second the poisonous bite has then been inflicted. Of course, any abrasion or scratch, however trivial, may be dangerous, as some of the virus may be inoculated or shed over it, probably not enough to kill, but sufficient to cause dangerous symptoms.

A snake that has bitten often, or that has very recently eaten, or that has been long in confinement without food, is less dangerous than others; its bite may be almost harmless, though not always so: a daboia that lived a whole year in a cage without food was deadly a few days before its death.

The popular notions as to the effects of the so-called antidotes are, I believe, erroneous; such for the most part being utterly powerless or inert. The ligature, excision or cautery, if applied in time, are the only rational remedies that can be of avail in a really poisonous bite. Others are recovered from by the inherent vigor of the person bitten, aided by rational treatment, support, stimulants, and possibly to some extent by arsenic, iodine, bromine, or potas, or others of the many remedies recommended; but as antidotes in the ordinary acceptation of the term even these, I fear, are no better than others.

The poisonous snakes when they either shed or lose by accident their fangs, regain new ones in from a few days to a month or six weeks. An echis was re-furnished with fangs, firmly anchylosed to the maxillary bone, on the third day after the removal of the former ones. If the whole mucous capsule be removed, and the maxillary bone injured in extracting the fangs, the reserve teeth already developed and the germs are also destroyed, and no new fangs are reproduced. This is often done by the snake-catchers, but when imperfectly, and the reserve fangs and germs not destroyed, fatal accidents have occurred from the unexpected re-appearance of fangs.

Snakes cast their epidermis frequently; the cobra and krait once or twice in a month, but the echis I have kept for three months without its changing its skin. Snakes will live months without food or water. A daboia lived for one year without food. It moulted frequently, became very thin, but it was active and poisonous to the last.

I conclude the summary by remarking that I feel thankful that I have brought this long series of experiments to a conclusion without any accident of a serious nature to those concerned in them. The constant manipulation of excited and vicious venomous snakes is a service of danger, and one in which we could hardly expect to be long engaged without some casualty. I am happy to say that only on two occasions was there any cause for anxiety. In the first, one of my assistants had a small quantity of cobra poison projected into the eye. Immediate ablution and careful avoidance of rubbing removed it, leaving only a temporary congestion and weakness of eye.

In the second case my principal snake-man was bitten by an echis in the thumb; immediate excision and cauterization of the part was had recourse to, and no evil results followed.

Experiments on the effects of the poison of the Hydrophidæ, by W. D. STEWART, Esq., *Civil Surgeon of Pooree, communicated by Dr. J. Fayrer.*

EXPERIMENT No. 1.

9th May, 1870, at 5-45 P. M.—The thigh of a half-grown fowl, cleaned of feathers, was presented to the sea snake. It bit rapidly two or three times, and drew blood. After being bitten, the fowl crouched on its bent legs and never stood again.

5-49.—Pupils dilated; shook its head as if excited; then began to droop; eyelids closing; beak resting on the ground.

5-50.—Raising its beak up and down; head rotating from side to side; sitting all the time; no convulsions.

5-55.—Lying on its side quite powerless.

5-59.—Dead in 14 minutes.

With a lens no punctures could be made out; even scratches could hardly be seen at seat of bite; blood dark, coagulated firmly.

From Mr. Stewart's description, I imagine the snake was H. Cyanocincta. In speaking of its fangs, he says:—"Fangs about two-thirds of a line long, with a double curve, first bent forwards at base, then backwards, before terminating in its point. Poison groove extends only from the four-fifth on anterior aspect.

EXPERIMENT No. 2.

10th June, 1870.—Present: Mr. Thomson, C. S., and Mr. Stewart.

A long thin-necked snake, with white pea-sized spots on side of neck; unable to bite. Poison gland removed, and inserted at 11 A. M. into a wound made in the thigh of a half-grown fowl.

11-12 P. M.—No apparent result.

3 P. M.—It was observed to be drooping and unable to move.

6 P. M.—Dead.

This snake was most probably H. Chloris.

EXPERIMENT No. 3.

July 1st.—A similar snake was obtained on 1st July. It was torpid, but the trial was made by pressing the jaws firmly over the thigh of a fowl.

No result.

EXPERIMENT No. 4.

June 20th.—A Pelamis Bicolor, torpid and unable to bite. Mouth opened, and jaws made to close firmly over fleshy part of a fowl's thigh.

No result.

EXPERIMENT No. 5.

June 29th.—A sea snake (probably H. Cyanocincta) was made to close its jaws on a chicken's thigh at 6 A. M., with firm pressure, as it could not bite voluntarily.

9 A. M.—Lame, crouched.

3 P. M.—Eye-lids half-closed; head drooping; respiration gasping, during which beak opens, and a crowing sound occurs; feathers ruffled; purged frequently.

June 30th.—Lying half-dead; refuses food; mark of bite bluish colour.

July 1st.—Recovered and able to move about; it remained well.

EXPERIMENT No. 6.

June 30th.—A Pelamis Bicolor, caught fresh in a hand net. It was quite lively, and able to bite.

A small fowl was bitten by it at 6-26 A. M.; the wound scarcely a scratch.

7 A. M.—Crouching, drooping.

8 A. M.—Beak rising and falling.

9 A. M.—Insensible.

9-50 A. M.—Quite dead.

Blood fluid after death.

EXPERIMENT No. 7.

July 5th, 1870.—A sea snake, a new species, allied to H. Hardwickii, bit a full-sized fowl in the thigh at 8-30 A. M. The marks of the bite were distinct.

8-34.—Fowl seated.

8-35.—Drooping; eyes closing; rotating the head on the beak in a sitting posture.

8-38.—Convulsed; head resting on ground.
8-42.—Continued convulsions.
8-42.—Legs thrown backwards in final spasm; tail spread out; quite dead in 17 minutes. Blood coagulated after death.

EXPERIMENT No. 8.

July 22nd.—The same snake was tried on a dog, but it was too feeble to bite: its jaws were pressed firmly on the inner part of the high. No evil result to the dog.

EXPERIMENT No. 9.

Hydrophis Cyanocincta, 4 feet long, bit a half-grown fowl voluntarily in the thigh twice or thrice, drawing blood, and leaving slight ecchymosis at 9-37.

9-40.—Fowl drooping; eyes closing; head resting on beak.
9.41.—Fell over on its side.
9-42.—Convulsed.
9-46.—Dead in 9 minutes.

EXPERIMENT No. 10.

The same snake bit a pariah dog, twice on the thigh, at 4-40 P. M.

5-20.—Dog restive, salivated, burrowing its muzzle in the sand.
5-25.—Seated, body thrown forwards, head down, partially convulsed, salivation increasing.
5-30.—Spasms; defecated.
5-35.—Involuntary evacuations; respiration slow; tongue hanging out of mouth; salivation very profuse.
5-40.—Dead in one hour.

EXPERIMENT No. 11.

July 23rd.—The same snake, kept alive in a hole in the wet sand, bit a full grown fowl at 7-35 A. M. This was not a fair bite, and took no effect. Bit again at 7-45 effectively. Fowl sat down after the bite.

8-11.—Lay down; head resting on beak; became convulsed.
8-25.—Convulsions.
8-35.—Dead.

The Hydrophis of four feet in length is evidently a very dangerous creature.

Experiments with Snake Poison by DR. FAYRER.

I am indebted to Mr. Galiffe, Collector and Supervisor of Calcutta Canals, for fine specimens of Hydrophis Coronata and Enhydrina Bengalensis from Dhappa.

EXPERIMENT No. 1.

A fowl was bitten in the thigh by Enhydrina Bengalensis, about 43 inches long, at 5-48 P. M. of 11th August.

The snake was sluggish, and could only be made to bite by forcibly closing the jaws in the fowl's thigh. The fangs were small, and barely drew blood.

5-51.—Crouched, and became convulsed almost immediately.

Died at 5-55, or in 7 minutes.

The blood formed a firm coagulum when removed from the body after death.

EXPERIMENT No. 2.

August 12th.—The above snake died at 9 P. M. yesterday. Its jaws were closed with pressure on a fowl's thigh this morning at 7-34 A. M.

8-5.—The fowl limps.
8-12.—Crouching; feathers staring; wings expanded.
8-20.—Head drooping, resting point of the beak on the ground.
9-5.—Remains in the same condition.
9-50.—Convulsed.
11-35.—Remained in much the same condition until death after four hours.

The poison of this snake when vigorous and fresh in its own element, the salt water, must be very deadly.

EXPERIMENT No. 3.

On the 9th August, a Hydrophis Coronata was made, with much difficulty, and only by pressure, to close its very small jaws on the comb, and then on the thigh of a half-grown chicken. At 3-30 P. M., the chicken was excited, but apparently not in pain after the bite.

4 P. M.—Pecked some grains of rice.
4-11.—Crouching.
4 16.—Head falls over; starts when its beak touches the ground.
4-30.—Drowsy; beak resting on the ground; wings drooping.
4-53.—Eyes closed, beak resting on the ground; starts at intervals; any noise makes it rise with a jerk.
5-15.—Cannot be roused by noise, but starts when touched; falls over on its side.
5-33.—Apparently dead, lying on its side; slight convulsions when raised by the wings.
5-55.—Dead in 2 hours and 25 minutes.

The poison of this snake is also very virulent; it was weak, had been many days in captivity, living in fresh water, but without food. The head is exceedingly small, and the fangs almost imperceptible. In its native element, I should imagine, it is, notwithstanding its small jaws, very dangerous. I have never met with a case of bite of the Hydrophis in the human being, but I think there can be no doubt that if a man were bitten by a well-grown snake, and in the water, where the snake would be active and vigorous, the danger would be as great as though he were bitten by a cobra on the land. Few accidents occur, the boatmen know the danger and avoid them.

Mr. Galiffe in his note to me also speaks of a fatal case in 1½ hours, which occurred somewhere in the vicinity of the Salt Water Lake.

In the Returns for 1869 I find a notice of a fatal case of a master of a ship who was bitten when bathing at Moulmein. I append a very interesting case, taken from the naval records, in which a seaman of H. M. S. *Algerine* was bitten mortally by a sea snake caught at Madras.

The case is in the transactions of the Zoological Society of London, vol. 2, p. 303.

"The other death in this vessel (H. M. S. *Algerine*) requires a more lengthened notice. On the 9th October, while the ship lay at anchor in the Madras roads, a water snake was caught measuring seven feet six inches long, and six inches and-a-half in girth at the thickest part. After the patient had handled the reptile for some time, it suddenly bit him on the inside of the index finger of the right hand, inflicting a wound resembling that caused by the point of a pin. He declined having the wound fomented, having been bitten by reptiles of the same kind, as he supposed, in the Straits of Malacca, without any bad consequences. At 8 A. M., half an hour after the infliction of the wound, he made a good breakfast, dressed, and about 10 o'clock went on deck. After taking a few turns, he was suddenly seized with vomiting, the matter ejected being of a dark-brown colour, resembling coffee ground, and of a very offensive odour. After a short time his pulse became small, variable, and intermitting, and the pupils were dilated, but contracted steadily by the stimulus of light. The left side of the face was slightly paralysed; there was subsultus tendinum, and the skin was covered with a cold, clammy perspiration; the countenance was anxious and indicative of much distress. In consequence of the spasmodic action of the muscles of the glottis, he breathed with great difficulty. The integuments from the wound to the wrist were slightly swollen, and on the right side of the neck and face they presented a mottled appearance of dark purple and livid colour. A ligature having been placed above the wrist, and fomentations applied to the hand, a liniment, composed of turpentine, liq. ammoniæ, and olive oil, was rubbed on the throat and neck. He made frequent attempts to swallow a mixture containing liq. ammoniæ and tinct. opii, but failed. At 10-20, in consequence of the spasms of the muscles of the glottis, he was put into a warm-bath, which apparently relieved the symptoms, and enabled him to take a dose of the mixture, which caused him to vomit a dark ropy fluid. About 20 minutes, after coming out of the bath (in which he remained 10 minutes), the spasmodic actions of the muscles of the neck and throat became more severe, and the whole body assumed a purple colour. The breathing became very difficult from the obstructions caused by a dark-brown substance, which came away in a stringy form from the air-passages. By 11 o'clock he was in a state of coma, the pupils were contracted, and the pulse imperceptible at the wrist. At 11-20, not quite four hours from the time he was bitten, he died. It does not appear that any *post-mortem* examination of the body took place. It will be remarked that the symptoms in this case very much resembled those produced by the bite of a rabid animal, although they were much more violent and more speedily fatal."

Taken from the Statistical Report on the health of the Navy on the East Indian Station in the years 1837, '38, '39, '40, '41, '42, and '43.

Remarks on certain of the Hydrophidæ, and Extracts from Notes on them by Mr. Stewart, *Civil Surgeon of Pooree.*

"I have been fortunate in getting a number of both these specimens (H. Cyanocincta) lately, but unfortunate again, in that they perished very soon after I got them; some in fact were brought nearly dead. Whether it is that the violent surf threw them on the shore, or that they are with difficulty kept alive when once removed from the sea, I am not sure. The fact, however, is the same, that though kept in a gurrah of sea-water and exposed to the air, the animals are very feeble after 10 or 12 hours.

"I intend to have readier arrangements in future, so as to get the snakes to bite as soon after they are caught as possible. I am sorry that my attempts to get them to bite lately have been a failure from the above cause; but I hope to be able to supply you with a few facts as soon as I can.

"The Pelamis Bicolor is called by the Telinga fishermen Kullunder Samp, and is looked on as a very deadly snake by them; but I hope to satisfy myself about the truth of this.

"I got a female Hydrophis Cyanocincta brought to me dead. It had 16 eggs in it, each as large as a full-sized hen's egg. The young snakes in each egg were perfectly formed, and about six inches long.

"I still experience the same difficulty in getting the snakes active enough to bite. When they are freshly thrown upon the shore, they are ready to bite; but by the time I get them they are exhausted.

"I have tried dissecting out the poison gland, and inserting it under the skin of the thigh of a fowl. The first was from a thin-necked small-headed snake. The fowl did not appear to be affected at the time, but was found all but dead three hours after; and by six hours was quite dead. I tried Pelamis Bicolor this way, but failed. I am not, however, satisfied with this, as I was told that the snake was first brought to my house while I was out, and had been biting at sticks and other things thrust into its mouth. So I think its poison may have been exhausted.

"Sea snakes are at this season (June) very difficult to obtain. In the quieter months of the cold weather, when a great deal of fishing goes on, I believe numbers are then caught in drag nets; whereas just now, with high sea and fresh breezes, nothing is done, and I have great difficulty in getting fresh specimens.

"A good plan for keeping the sea snakes alive is to make holes in the wet sand near the sea-water. I was thus able to keep one alive all day, and able to bite yesterday evening and again this morning. So placed, they must be protected from kites and crows by a cover of some kind.

"From my little experience of the Hydrophidæ, I can say that I have not yet seen one which did not kill if it bit fairly. Three difficulties I have noticed in the way of a fair bite; first, the inertness of the snake after being removed from its native element; second, the extreme difficulty in getting its small poison fangs to insert in anything like tough skin; third, the feeble power of the jaws of some, from natural conformation and from want of muscular action, necessary for full closure, and expulsion of the poison. Every snake that was found active and able to bite of itself, closing its jaws perceptly, inflicted a fatal wound. Mere pressure of the jaws of dead and dying snakes over soft parts, with the view to bring out the action of the poison, was in nearly every instance followed by no result.

"The dissection and insertion of the poison gland was tried in two instances; in one death followed after some hours; in the other case it was a failure. I have been trying to find out from fishermen any peculiarities they know of the Hydrophidæ, but their statements are seldom the same on two occasions.

"I have not been able to hear of any fatal bites from sea snakes in fishermen, who dabble so freely in the waters, either when fishing with small hand nets near the shore, or in catamarans further out. As I said before, many snakes are enclosed in deep sea-nets, but these men know their deadly properties and lift them away.

"The fact of these men plying about so freely in the water near the surf, and withal escaping being bit, should go far to remove the fears of sea-bathers, even though it be more generally known that they are liable in the enjoyment to be in proximity to such deadly neighbours. I have enquired of several fishermen, but not one can recollect of any man losing his life in this way.

"Natives declare that Pelamis is the most deadly of all, and refer to their Shastras about it. The boatmen believe that this snake bit Mahadeb, and the god, to cool the burning effect of the venom, dipped himself in the sea, on which account Juggurnauth (or Maha Probha, as he is also called) banished the Kullunder Samp (Pelamis) beyond the seas. Mahadeb is a god worshipped under water, and exposed only once a year. I have not had an opportunity of enquiring into this fable from the pundits."

In addition to these notes, Mr. Stewart has been kind enough to send me some fine specimens of Pelamis Bicolor, Hydrophis Cyanocincta, H. Jerdonii, H. Curta, H. Chloris and another new species which Dr. Anderson, the Curator of the Indian Museum, says is allied to H. Hardwickii, but quite different. He has named it H. Fayreri.

With several of these Mr. Stewart was able to experiment, and the results of these experiments, which are appended, prove that the venom of the Hydrophidæ justifies the evil repute it has acquired.

My own experience of the Hydrophidæ is limited to experiments with H. Coronata and Enhydrina Bengalensis. For these specimens I am indebted to Mr. Galiffe, Collector and Supervisor of Calcutta Canals. They were caught by fishermen in the tidal nullahs near Calcutta, and experiment proved them to be very poisonous.

On enquiry from Mr. Galiffe on the subject, he says—"I have enquired from the fishermen of any fatal case of snake-bite. In one instance a fisherman was bitten by one Ghanga Berah, and died in 1½ hour. They speak of three other kinds, whose bites, however, are easily cured."

Mr. Stewart observes, what has been noticed by others, that the Hydrophidæ are very delicate and die soon after being captured, even if in their native element. I was astonished, therefore, to find that a fine specimen of H. Coronata lived for 8 or 10 days, although it was only occasionally placed in a jar of fresh water, the rest of the time living in an ordinary cage like other snakes. The movements were exceedingly graceful in the water, whilst it seemed powerless, stupid, and blind on the land. Its head and jaws were exceedingly small, and it was with the greatest difficulty it was made to bite, and then only by compressing its jaws; when, however, it did insert its fangs, small as they were, the poison was soon fatal to a fowl.

Fatal case of poisoning by Daboia Russelli by DR. W. A. THOMSON, *Staff Surgeon, H. M. S. "Thayetmyo," communicated by Dr. J. Fayrer.*

The following very interesting account of a fatal case of snake-poisoning has been forwarded to me by Dr. Thomson, Staff Surgeon, H. M. S., from Thayetmyo, in Burmah.

From the description, the snake was evidently Daboia Russelli, or Russel's Viper, the Ticpolonga of Ceylon.

28th Sept. 1870.

The following instance occured at Thayetmyo, British Burma, in May 1868. The subject was a gunner of the Royal Artillery. By kind permission of Dr. Croker, R. A., at present in medical charge of A-23, R. A., I am enabled to furnish the following particulars extracted from the Case Book.

The case was recorded by Dr. Murray, Staff Assistant Surgeon, who was in medical charge of the Battery at the time the accident occurred.

R. W., age 23 years. Service 9 years.

A strong powerfully-built man, of good muscular development, was admitted into hospital this morning (May 22nd, 1868). States that soon after daybreak, as he was entering the "fowl-house," which is in close proximity to the barracks, he observed a dark thick-set snake of about two feet and a half in length (species unknown, but not a cobra), and that he took up a piece of bamboo and began teasing it, whereupon the reptile turned and bit him on the finger.

The snake held on for a short time, and it was with some little difficulty the man shook it off. The "fowl-house," where the accident occurred, is distant from the hospital about 600 or 700 yards. The man came at once to hospital, being advised by one of his comrades to do so, when on the way he became very weak.

The apothecary saw the patient on his arrival at hospital.

It is supposed that a lapse of 20 minutes must have occurred from the time he received the bite until he reached the hospital, and nothing had been done meantine in the way of remedies.

The apothecary immediately scarified the wounded finger freely, made the patient suck the wound, and administered ammonia. I was then sent for, and proceeded without delay. On examination, I found two small punctured wounds on first phalanx of index finger of the left hand. The finger itself was swollen and livid.

The patient complained of very little pain, but seemed naturally anxious, although it was considered by many that the snake was non-venomous.

I ordered hot fomentations with a view to encourage, as much as possible, the bleeding from the part where it had been freely scarified.

I also ordered constant fomentations all over the arm.

An aperient was given. It was directed that the patient be carefully watched.

Vespere, 6 P. M.—The bowels were moved through the day, but the patient has been restless, turning on one side, then on another.

The finger and hand are considerably swollen and discoloured, and the fore-arm is partially so.

The pain is not severe, although he complains of it, extending up the arm; no swelling from elbow upwards.

Is slightly feverish.

Pulse good and not hurried; complains of thirst; ordered lemonade to drink.

To have an opiate at bed time.

The hand and arm to be constantly stuped with poppy-heads, and the patient to be carefully watched during the night.

23rd May.—On my visit this morning, I found the man most dangerously ill.

At times excited, tossing about his arms and legs in every direction, and rolling his head from one side to another.

The pulse almost imperceptible. Breathing hurried, 40·1′. Surface covered with cold clammy sweat. Conscious when roused, and then immediately falling back into a stupor.

Face suffused.

Ordered brandy and water, stimulating draughts of ammonia, and turpentine stupes to extremities.

The left hand and arm greatly swollen. Bluish tint over the hand. Surface from elbow to shoulder much reddened.

The inflammation extended to the left side of chest, which was also red and swollen.

He rallied a little for upwards of an hour between 7 and 8 A. M., and then began to sink. Pupils became contracted, and insensible to the stimulus of light.

From 8 A. M. he became rapidly unconscious. Now and again he tossed himself about with such violence that the attendants had some difficulty in keeping him in bed.

The treatment mentioned above was persevered in, and, in addition, galvanism was applied along the spine and over the chest.

At 8-30 A. M. he was moribund. Respiration 40. Restless and unconscious. Heart's action fluttering. Spasmodic twitchings observed over course of diaphragm. Pulse at wrist not detected.

Died at 9 A. M.

Post-mortem appearances 7 hours after death.

External appearance of the body was that of a person who had been well nourished and healthy, and of great muscular development.

The left hand and arm were considerably swollen; also swelling of left axilla.

Two small punctured wounds were observed on first phalanx of index finger of left hand.

Head.—On removing calvarium, considerable congestion was observed of the vessels on the surface of the brain. There was a general softened state of the brain subtance throughout.

In right lateral ventricle a small quantity of serous fluid was found.

Thorax.—Lungs collapsed. When cut into were found gorged with blood, the latter being remarkable for its fluidity. The apices of lungs were emphysematous.

Heart.—Size normal, structure healthy. A large clot of blood in left ventricle, extending into ascending portion of aorta, and having appearance and consistence of black currant jelly; clots were also found in right ventricle and auricle, and in pulmonary arteries. That in the latter was semi-fluid.

Liver.—Normal, and appearance when cut into healthy.

Gall bladder distended with bile.

Bowels.—Appearance healthy. Spleen, natural size, soft and easily broken up by the fingers. Kidneys, healthy in structure, and normal in size. Bladder empty.

REMARKS.—The above case was highly interesting. I saw the man about one hour and a half before death, when his symptoms were exactly as described by Dr. Murray.

I did not see the snake, as unfortunately it had been destroyed and thrown away the day before.

The following description, however, was given to me by Assistant Apothecary Roberts, A-23, R. A:—

"It was a snake about 2½ feet in length, with a flat oval head. The thickest part of the body measured about three inches in circumference. The tail was five inches long.

"The colour of the head and back of a French grey; the belly white.

"In the middle of the back ran a row of lozenge-shaped spots (white).

"It had two large curved fangs."

I am inclined to believe from the description that the snake was a species of viper.

THAYETMYO,
The 25th July 1870.

W. A. THOMSON, *M. D.*,
Staff Surgeon.

Note.—When the left hand was cut into, the muscles were found disintegrated and of a dark colour. When the upper arm was cut into, the muscles soft and infiltrated with serous effusion.

D. MURRAY, *M. D.*,
Staff Asst. Surgeon.

On the Treatment of Snake-bite.

Snake poison produces fatal or deleterious effects, either by completely paralysing the nerve centres, and thus causing rapid dissolution, or by partially paralysing them, and poisoning the blood, thereby inducing pathological conditions of a secondary nature, which may, according to circumstances, cause the slightest or the most dangerous symptoms.

The effect produced depends on two sets of conditions: *first*, the species of the snake, its actual state at the time, the quantity and quality of its poison, and the circumstances under which it inflicts the bite; *second*, the species, size, and vigour of the living creature, and the circumstances under which it is bitten.

Snake poison is essentially a neurotic, or nerve force paralyser, and, when it takes full effect, it kills by annihilating, in some unknown way, the source of nerve force.

But it is also an irritant; for, if applied to a mucous membrane, or to the conjunctiva, it causes violent inflammation; absorption at the same time takes place, and the symptoms of poisoning are produced.

It is also, to a certain extent, a septic; for if the bitten creature survive, the wound and the parts about it are apt to slough and to induce septicæmia. The poison acts by absorption; that is, by entering the circulation, and so reaching the nerve centres; it produces, according to the quantity or intensity of the venom, either death, or severe local and constitutional symptoms. If it find entry by a large vein, such as the femoral or jugular, life may be destroyed in a few seconds.

The blood itself is affected by the poison. I have not been able to detect any corpuscular changes, such as those described by Professor Halford, nor have I any exact information on the chemical changes it undergoes or may have undergone; but that it is altered there can be no doubt; and in poisoning of the lower animals, at all events by the viperidæ, its coagulability after death is generally destroyed, whilst after death by poisoning, by the colubrine snakes, the blood generally coagulates.

As the blood is the channel through which the poison acts, it is obvious that the first object should be to arrest, destroy, or prevent its entry into the circulation, or, if it have already entered, neutralize or counteract its action, or to procure its elimination by the agency of the natural depurating organs and their secretions, and to treat local, consecutive, and constitutional symptoms by such remedial measures as may be required by the patient's condition. Absorption takes place with extreme rapidity; so fast, indeed, that it was formerly supposed, in the case of some of the more active poisons, that they acted by transmission of a shock through the nervous system; and, so far as we know at present, it is not improbable that such, in some instances, may be the case. But rapid as the effect of snake bite sometimes is, there is no reason to believe that it operates on the nerve centres through any other channel than that of the vascular system.

The experiments of Blake, Hering, and later of Claude Bernard, show that absorption takes place with such rapidity as to explain the most rapid deaths from such cause. Blake (*vide* Guy's Forensic Medicine, 3rd edition, page 388) found that a poison passed from the jugular vein to the lungs of a dog in from four to six seconds; from the jugular vein to the coronary arteries of the heart in seven seconds; a poison injected into the jugular vein was distributed throughout the circulation in nine seconds. Claude Bernard found that a saturated solution of sulphuretted hydrogen introduced into the jugular vein of a dog began to be eliminated from the lungs in three seconds, and when injected into the femoral vein of the same dog in six seconds.

I have neither seen nor heard of any case of snake poisoning in man or the lower animals so rapid, though in some I have observed the first symptoms in a few seconds, as to justify the conclusion that poisoning had occurred otherwise than through the medium of the circulation.

Such being the rapidity of the absorption and action of the poison, it is obvious that if the means, whatever they may be, of destroying and arresting its entry, be not applied immediately, but little benefit can be expected from them. If more than a few seconds have elapsed, we can only hope by these measures to prevent the entry of so much of the poison as may be diffused in the areolar tissue surrounding the bitten spot.

As the chief hope of safety lies in preventing the entry of any poison at all into the circulation, the earlier appropriate measures are resorted to, the better is their chance of success. These I will now describe.

The ligature.—This, if applied immediately, at a little distance above the bitten part, may not only arrest the entry of the poison into the circulation, but may also prevent its diffusion in the areolar tissue in a centric direction. The efficacy of this method of treatment has long been recognized by the natives of this country, who apply it, not just above the bite only, but at several places on the limb at intervals of some inches. There is reason to believe that if this be done without delay, the course of the poison may sometimes be stayed and life saved. Not long ago I saw a professional snake-charmer in the employ of the King of Oude, who said that he had been bitten in the finger by a fresh cobra. A ligature was immediately tied in three or four places above the bite, and though he suffered constitutionally to some extent, he had escaped with life. His finger, however, was shrunk and anchylosed, owing to excessive burning, the result of fire which was applied in the form of live-coal until the tendon shrivelled and was destroyed.

The danger and difficulty lie in not applying the ligature quickly enough. The confusion and alarm caused by the bite, the brief time that must elapse before the simplest ligature can be improvised, are liable to cause dangerous delay; and with every second of time lost, the danger increases. There is also the probability that the ligature may not be sufficiently tightened; no mercy, therefore, can be shewn; it must be tightened to the utmost, or it will not effect its purpose, and the poison will enter and do its fatal work. A piece of the dress twisted, a bit of string, a strap, anything that can be made to enclose the limb or part, should be immediately applied, and should be strained to the uttermost by twisting with a piece of stick; nor should the tension cease until the circulation is entirely arrested, and the part is livid with the retained blood.

The experiments I have made on the lower animals show not only how rapidly the poison enters, if the circulation be not immediately arrested, but also how difficult it is so thoroughly to compress the limb as to completely stop the circulation.

I found it all but impossible, with the strength of a pair of hands, so to tighten the ligature as to effect complete strangulation of a dog's hind leg.

The method most likely to succeed would be to tie the ligature tightly round the part, including a piece of stick, or some such lever, and then, by twisting the stick, so completely strangulate the part that circulation ceases—at whatever cost, this should be done. If the bite be in a finger, thumb, or toe, the first ligature should be applied a short distance above the bite, a second on the fore-arm or leg, and even a third higher up; it is the best, perhaps the only, chance of saving life; and however great the pain, it must be endured. No time should be lost in scarifying the punctures so as to allow the blood to flow freely; and then in applying fire, a live-coal, a red-hot iron, some caustic, mineral or carbolic acid, to the wound, so as to destroy the poison which is contained in the strangulated part; the disorganization must be very complete, or even then it will fail, as enough of the poison may remain to be subsequently absorbed when the ligature is removed, and after all destroy life. In the case of a finger or toe, I believe that immediate amputation would be justifiable, if the sufferer or his companions, an instrument being at hand, had the moral courage to lop off the part at once.

The natives are in the habit of placing a live-coal, or of exploding gun-powder, on the bitten part, and no doubt they are right in doing so.

The place and circumstances under which snake-bites occur are frequently such as not to leave much choice of means; but it would generally be possible to extemporize a ligature and a hot coal, or perhaps among sportsmen a little gun-powder might be forthcoming. Should the bite be inflicted on a part of the body where a ligature could not be applied, the only expedient remaining is to excise the part to the depth of punctures, let it bleed freely, and then apply fire or caustic. There is no time for reflection or consideration; it must be done at once, and thoroughly, or there is no hope of avoiding the influence of the poison. If the snake has been seen and recognized as venomous, no doubt remains as to its necessity. But, if it has not been seen, and the marks indicate a poisonous snake-bite, the patient must have the benefit of the doubt, or his chance of life may be lost.

Suction either by the mouth or cupping-glasses is useful; for the latter purpose any small vessel might suffice; a little spirit or a piece of burnt paper alone would serve to exhaust the air; that by the mouth is efficacious, but it must be borne in mind that there is danger in applying the poison to the lips, for it may be absorbed, and evil results follow to the operator. But suction, however practised, should be applied after the ligature in those cases where that application is practicable; where it is not, after excision, and before the application of caustic or cautery. Fire may be applied, as I have said, either by the live-coal, the hot iron, or by exploding gun-powder on the part, or by the moxa.

The mineral acids, chloride of zinc, carbolic acid, or strong acetic acid, may be applied with a piece of old linen or cotton attached to the end of a piece of stick or other convenient vehicle.

The liq. ammoniæ, or liq. potas, are among the local applications recommended, but I have ascertained, by experiment, that they do not destroy the poisonous properties of the verus, although *mixed with it* in even more than equal quantities, and therefore are not to be trusted. Ipecacuanha, iodine, and other specifics are recommended as local applications. They are, I fear, useless.

Such are the local measures to be resorted to. At the same time, as there is great and rapidly increasing depression both from mental as well as physical causes, stimulants should be given at once frequently and freely. Hot brandy, or whisky, or rum and water, equal parts of each, are the best. Ammonia is also useful as a stimulant, and may be given in any of its officinal forms—the carbonate, the liq. ammoniæ, or the eau-de-luce. But it is simply as a stimulant, and has no specific or antidotal action beyond this. At the same time, warmth and sinapisms to the precordial and epigastric regions, in some cases cold douches, and all measures that may tend to rouse and stimulate the failing nervous energy, should be resorted to. So far popular notions are supported by science. But another popular view of the treatment of the so-called lithargy induced by the poison—that by walking the person violently about, and keeping him awake by flogging, pinching and other such violent measures—is, in my opinion, of very doubtful efficacy, if not altogether wrong. The man who is dying from snake-bite is perishing from rapid exhaustion of nerve force. To make him take violent exercise and deprive him of rest seems to me more likely to do harm than good. It would be almost as reasonable to give a man a blow on the head to recover him from concussion of the brain, or give him antimony to cure him of sea-sickness. Let him lie down; leave him to rest, to sleep, if he can. Many of the cases of so-called poisoning are not poisoning at all; the snake has not been seen, and it may have been innocent, or it may have been a poisonous snake, but exhausted. The punctures are there, and the appearances are all those of snake-bite. But the depression is due to mental shock from the dread of impending death. I have seen such a case.

Rousing, in the fashion I have alluded to, might do good here, but I believe that in real poisoning it can do only harm by exhausting the already-sinking powers of life. It may be said, it has often succeeded; people have been so treated and recovered. Who can say they would not have recovered as soon, perhaps sooner, without it? "*Post hoc*" does not always mean "*Propter hoc.*"

With reference to the snake stones which, when applied to the bites, are said to absorb and suck out the poison and obviate its evil effects, I have only to say that I believe they are perfectly powerless to produce any such effect. Of this more subsequently.

As unfortunately, in a large number of cases, persons who have been bitten by venomous snakes are not so promptly and vigorously treated, and the poison has found entry and manifested its presence by dangerous symptoms, it is too late to hope for any benefit from the application of the ligature or other local measures having for their object neutralization or destruction of the poison. The only course of treatment now to be adopted is that of endeavouring to neutralize or counteract the action of the poison which has already affected the nerve centres and poisoned the blood, and to support the strength during the continuance of the depressing influence.

This brings me to speak of the so-called antidotes, many of which have been and are so much vaunted. To name them all would be impossible, but I may say that most reliance has been placed on a few, such as ammonia, arsenic, iodine, bromine, the poison and the bile of other snakes, the guaco plant, ipecacuanha, aristolochia, senega, and, indeed, on nearly every drug in or out of the pharmacopœia, to say nothing of many other things that have been in vogue among the ignorant, vulgar, or superstitious, and that have nothing whatever but credulity to suggest their utility. I have made repeated experiments with many of them on the lower animals, and have seen nothing to induce me to believe that they have any good effect whatever.

I have no hesitation in saying that I believe them to be useless, and that excepting for their stimulant action, when they have any, they are inert. When the symptoms of poisoning have set in, either when the ligature and excision, or caustic or cautery, have failed, or when they have not been used, I believe that the only rational treatment is to endeavour to rouse the sinking energies, and arrest the tendency to fatal paralysis of the nerve force, by the aid of alcohol or other stimulants, such as ammonia or ether, judiciously administered, avoiding anything that can depress, such as fatigue or over-exertion, especially that of the popular method of making the sufferer walk when his force is almost expended. Brandy or whisky, indeed any form of alcohol, should be given freely and frequently, though not in large quantities sometimes recommended. Galvanism may also be of service along the spine to the solar plexus or to the heart; in certain cases cold douches may be useful. Hot bottles and sinapisms may be applied, and every encouragement should be given to the sufferer, for much of the depression depends on mental causes. I have seen a strong man, who appeared almost at the point of death (from fright , recover in a very short time when I told him that the snake that had bitten him was innocent, and let it take hold of my finger to prove it so. So that whatever can be done to remove this element of depression, should be done by encouragement and assurance of safety (when the snake is found to have been innocent or weak), and in other cases, with hopes of recovery, which not unfrequently takes place, not because antidotes have been given, but because the bite has been imperfect or the snake incompetent; and, no doubt the recovery may be aided and expedited by treatment such as I have described. It will be inferred from what I have said that I put little faith in any of the so-called antidotes. My views of the treatment of snake-bite are, that if the early endeavours to prevent the entry of the poison into the system are unsuccessful, as unfortunately is too frequently the case, our reliance must be placed on supporting the strength with alcoholic, ammoniacal, or ethereal stimulants. and by treating consecutive mischief of constitutional or local character by such combination of remedial measures as the peculiar symptoms may suggest. My belief is that, if a certain quantity of the poison have entered the circulation, we can expect but little benefit from treatment of any kind; where less has entered, yet enough to cause dangerous, present and consecutive symptoms, we may do much to support the strength and save life by ordinary rational measures. But that we possess any drug or substance, solid or fluid, that, either swallowed or inoculated, can counteract or neutralize the poison once absorbed, and acting on the nerve centres, I do not believe, and I think the notion that we do is a dangerous one and liable to do harm by inspiring confidence in ways and means in which none should be placed. I have already explained how snake-bites may occur, and yet the bitten person may not be poisoned at all, or so slightly, as to leave it quite possible that recovery may take place. In such cases, recovery is due mainly to the inherent vigour of the individual, and in part, no doubt, to treatment. It is also my belief that a large proportion of such cases would recover without any treatment at all, though in some the judicious use of remedies may turn the balance in the patient's favor. I neither wish to discourage treatment, nor to throw cold water on investigation, but merely to state the facts as I think they exist.

It is right that the truth should be known, even if it be not what we could wish it; and it is better that we should study preventive measures and ascertain exactly how much we can do in those cases where our aid may be of avail, than that we should trust to measures which common sense and science alike should make us distrust.

With reference to the subsequent effects, constitutional or local, they should be treated on ordinary surgical principles. The strength should be supported by nutrients and wine, with such mineral or vegetable tonics as may seem appropriate. Collections of pus should be evacuated; the separation of sloughs aided by poultices and antiseptics, and the healing wounds dressed as other wounds of a similar form or character from other causes would be dressed and tended.

Should symptoms of a pyæmic or septicæmic nature arise, we must treat them as we would do similar conditions arising under other circumstances. The result will depend on the extent of blood-poisoning and the vigour of the person.

Although, from what I have said, it will be evident that in cases of real bites from the deadly forms of snake our reliance is chiefly on early and preventive measures, and not on the so-called antidotes, I hope it will not be inferred that I mean we are altogether powerless; far from it! I believe that in a number of cases—and I have described them—we may be of use; and we can, at all events, alleviate suffering, give hope and confidence where we are justified in doing so, and do all that science and common sense suggest as likely to be of service. The plan suggested by Dr. Halford, of Melbourne, of injecting ammoniæ into the veins, does certainly seem more rational than most suggestions that have been made, and I regret exceedingly that in my own experiments it has proved of no avail. The reason may, indeed, be in the greater virulence of the Indian Thanatophidia, and this may be the explanation of my failure where Dr. Halford has found success. But after all, the more venomous snake is the most crucial test. I would say the same in reference to the similar use of the liq. potas by Dr. Shortt in Madras. He, I believe, does not attach the same amount of importance to it as Dr. Halford does to the ammoniæ. In my researches both have been equally powerless, and I confess that I have felt much disappointed that experience has not confirmed the benefit of what certainly were rational suggestions by authorities to whom science is deeply indebted for much valuable information and most earnest investigation on an important subject.

I would summarize the treatment of snake-bite as follows:—Apply, at once, a ligature or ligatures, at intervals of a few inches, as tight as you can possibly tie them; and the one nearest to the wound tighten by twisting with a stick or other such agent. Scarify the wound, and let it bleed freely. Apply either a hot iron or live-coal, or explode some gun-powder over the part; or apply either carbolic or some mineral acid or caustic. Let the patient suck the wound whilst you are getting the cautery ready; or if any one else will run the risk, let him do it.

If it be a positive bite on a toe or finger, especially if the snake has been recognized as a deadly one, either completely excise, or amputate immediately at the next joint. If the bite be on another part, where a ligature cannot be applied, or indeed if it be on the limbs above the toes or fingers, cut the part out at once completely.

Let the patient be quiet. Do not fatigue him by exertion. When, or even before, symptoms of poisoning make their appearance, give eau-de-luce, or liq. or carbonate of ammoniæ, or even better than these—hot spirits and water. There is no occasion to intoxicate the person, but give it freely, and at frequent intervals.

If he become low, apply sinapisms and hot bottles, galvanism or electro-magnetism over the heart and diaphragm. Cold douches may also be useful.

The antidotes, in addition, may be used by those who have faith in them; but, as I have said, I fear there is no reason to believe that they are of any use. Encourage and cheer the patient as much as possible. As to local effects, if there be great pain, anodynes may be applied or administered, and antiseptic poultices to remove sloughs; collections of matter must be opened.

Other symptoms to be treated on general surgical principles.

This, I believe, is the sum and substance of what we can do in snake-bite. If the person be not thoroughly poisoned, we may help him to recover. If he be badly bitten by one of the more deadly snakes, we can do no more.

I take the following account of the snake-stone from Sir E. Tennent's work on Ceylon:—

"They are of the size and appearance of small black almonds, highly polished, and of an extremely light substance. They are said to attach themselves closely when applied to the bitten part, the blood that oozes from the bite being rapidly imbibed by the porous substance of the so-called stone. They adhere tenaciously for three or four minutes. Meanwhile, the bitten limb is well rubbed downwards from the shoulder towards the fingers. At length they drop off, and the bitten person is said to be free from danger. Instances are narrated where happy result occurred. A bit of root is at the same time passed over the stone. One bit of root so used proved to be an aristolochia stem."

The snake-stone was examined by Professor Faraday, who expressed his belief that "it is a piece of charred bone, which had been filled with blood, perhaps, several times, and then carefully charred again. Evidence of this is afforded, as well by the apertures of cells or tubes in its surface as by the fact that it yields and breaks under pressure and exhibits an organic structure within. When heated slightly, water rises from it, and also a little ammonia; and if heated still more highly in the air, carbon burns away, and a bulky white ash is left, retaining the shape and size of the stone." This ash, as is evident from inspection, cannot have belonged to any vegetable substance, for it is almost entirely composed of phosphate of lime. Mr. Faraday adds that "if the piece of matter has ever been employed as a spongy absorbent, it seems hardly fit for that purpose in its present state; but who can say to what treatment it has been subjected since it was fit for use, or to what treatment the natives may submit it when expecting to have occasion to use it?"

Tennent goes on to say: "The probability is that the animal charcoal, when instantaneously applied, may be sufficiently porous and absorbent to extract the venom from the recent wound, together with a portion of the blood, before it has time to be carried into the system; and that the blood which Mr. Faraday detected in the specimen submitted to him was that of the Indian on whose person the effect was exhibited. The snake-charmers from the Coast, who visit Ceylon, profess to prepare the snake-stones for themselves, and to preserve the composition a secret. Dr. Davy, on the authority of Sir A. Johnston, says the manufacture of them is a lucrative trade carried on by the monks of Manilla, who supply the merchants of India; and his analysis confirms that of Mr. Faraday. Of the three different kinds which he examined, one being of partially burnt bone, and another of chalk, the third consisting chiefly of vegetable matter resembling bezoar, all of them (except the first, which possessed a slight absorbent power) were quite inert, and incapable of having any effect except in the imaginations of the patient. Thunberg was shown the snake-stone used by the boors at the Cape in 1772, which was imported for them from the Indies, especially from Malabar, at so high a price that few of the farmers could afford to possess themselves of it. He describes it as convex on one side, black, and so porous, that, when thrown into water, it caused bubbles to rise, and hence, by its absorbent qualities, it served, if speedily applied, to extract the poison from the wound."

In a foot-note, Tennent gives the following further particulars since the foregoing account was published: "I have received a note from Mr. Hardy relative to the *piedra ponsona*, the snake-stone of Mexico, in which he gives the following account of the method of preparing and applying it: 'Take a piece of hart's horn of any convenient size and shape, cover it well round with grass or hay, enclose both in a thin piece of sheet copper well wrapped round them, and place the parcel in a charcoal fire till the bone is sufficiently charred. When cold, remove the calcined horn from its envelope, when it will be ready for immediate use. In this state it will resemble a solid black fibrous substance of the same shape and size as before it was submitted to this treatment. *Use.* The wound being slightly punctured, apply the bone to the opening, to which it will adhere firmly for the space of two minutes, and when it falls, it should be received into a basin of water; it should then be dried in a cloth, and again applied to the wound. But it will not adhere longer than about one minute. In like manner it may be applied a third time; but now it will fall almost immediately, and nothing will cause it to adhere any more.'

"These effects I witnessed in the case of a bite of a rattle-snake at Oposura, a town in the Province of Sonora, in Mexico, from whence I obtained my recipé; and I have given other particulars respecting it in my travels in the interior of Mexico, published in 1830-31.—R. W. Hardy, Bath, 30th January 1860."

There is a germ of possible truth in the idea that these stones can be of use; for, if they absorb as they are said to do, no doubt some blood and poison mixed are taken up by their pores.

But when we reflect on the quantity of poison and the force and depth with and to which it is injected through the fang of either cobra or viper, and the extreme rapidity with which it is hurried along in the vascular system to the nerve centres, I think it is obvious that this can be of little use in a *real bite* of a deadly snake, and that it is a dangerous delusion, as it may be the cause of the loss of the first two or three seconds, which are so precious to the sufferer, for on what is done in them, his life may depend. I may add that I have found the snake-stone as powerless for good as any of the so-called antidotes.

MEMORANDUM by DR. V. RICHARDS, *Civil Medical Officer, Balasore, dated 12th December 1872, on Dr. Halford's Treatment in Snake-bite, communicated to Dr. Fayrer.*

In a letter to E. C. Bayley, Esq., C. S. I., Secretary to the Government of India, Professor Halford of Melbourne defends his mode of treatment. I purpose showing, in the following lines, with what success.

The question at issue is this:—Is the injection of ammonia into the veins a remedy for the bite of an Indian venomous snake?

Dr. Halford asserts that, reasoning by analogy, his opinion is that, if "ammonia be as freely injected into men's veins in India (instead of dogs) as it has been in Victoria, it will become as great a favourite there (in India) as it is here (in Victoria)."

I will first proceed to examine the grounds on which Professor Halford has founded his opinion. On the statement of Dr. Fayrer—to the effect that "the injection of ammonia into a vein fails to counteract the action of the virus of the deadly snakes of India on the lower animals—" Dr. Halford remarks that "the actual experiments on human subjects prove its efficacy." The basis, therefore, upon which Dr. Halford seeks to establish the efficacy of his mode of treatment, is actual observation on human beings. But he remarks in the 9th paragraph of his letter to Mr. Bayley—"no one, I suppose, will deny that a bite that ends fatally is a really severe one. *But who is to know whether any bite is going to end fatally?*" Again in the 11th paragraph—"all experience, and all the literature of snake-poisoning, tells us *we cannot say what is and what is not a severe bite until the result*; and if we wait for that, of course it will be too late for treatment." And yet it is on these very conditions that the efficacy of his treatment is sought to be established—actual observation in cases in which it is absolutely impossible to tell whether the bites were *legitimate* or not. Strange as it may appear, it is nevertheless true that nearly all those who come under treatment for snake-bite *recover under very different modes of treatment*, and it is due to this fact that so many reputed antidotes exist. This being the case, adopting the line of argument introduced into the 10th paragraph of Dr. Halford's latter—*If* liquor ammoniæ had been injected into the veins in all these cases of recovery, it would have been "set down" to the treatment. In fact, had any one universal mode of treatment been adopted (as appears to be the case in Victoria) that treatment would have been regarded as a panacea, an antidote, no matter how much "beside the truth" it would have been. The futility of seeking to establish the value of any treatment upon such uncertain conditions as these "observations made on human subjects" being acknowledged, it becomes necessary to consider what other procedure is more valuable as a means of enabling us to draw reliable deductions.

It is manifestly impossible to experiment with snakes on human beings (in the true sense of the word "experiment"—that is, where all the conditions are in the power of the experimenter); we must, therefore, do so on the lower animals.

Dr. Halford admits, with regard to the poison, that "it is perfectly true in a broad sense that the effects of snake-poison are similar in man and in the lower animals," and states that it was "from seeing the beneficial effects of injected ammonia in snake-poisoning *in dogs*, that he recommended its use in similar cases in men." All the arguments regarding the injection into the veins of large quantities of morphia and atropine are therefore beside the question. The result of a snake-bite, whether in the lower animals or in man, is death, and the result of Dr. Halford's treatment, according to his shewing, both in the lower animals and in man bitten by venomous snakes, is recovery. These being Dr. Halford's own convictions, it is very remarkable to find him ignoring the experiments made on the lower animals in this country, especially as he "concludes that there is little difference between the Australian tiger-snake and the Indian cobra as regards the power of the poison."

Like Dr. Fayrer, I have carefully tested the injection of ammonia into the veins of the lower animals bitten by Indian venomous snakes, and unhesitatingly assert that it has failed to prevent death even in a single instance. I think, therefore, considering all the circumstances, we are justified in concluding that Dr. Halford's treatment "has no power in saving life in the bite of an Indian venomous snake."

So much for the efficacy of the treatment: now for its utility and general applicability, *presuming* its efficacy established.

Dr. Halford is no doubt little acquainted with India. How many of the "20,000 who die annually in India from snake-bite" come under the treatment of European medical men, or natives educated in the science of medicine? It will probably astonish him to find that not 20 do. Granting him, then, "the one in twenty saved," "*the fact remains*" that one life out of 20,000 would be saved. Professor Halford's procedure is much too complicated: *instruments, professional skill*, besides immediate action, are necessary. The action of the cobra and other snake-poison is rapid, death occurring from fifteen minutes to a few hours. Does Dr. Halford suppose that each village has its educated medical man, and, even if it had, the villagers would apply to him, instead of to their native snake-charmers? It would appear so. Although I resided for five years in the District of Bancoorah (one of the worst in India for snakes), in which 100 people die annually from snake-bite, not one of them during the whole five years came under my treatment, but eight, who recovered under various treatment, did. Now, had I injected ammonia into the veins in each instance, and claimed for that treatment absolute success in my hands, "*it would have been beside the truth.*" What would Professor Halford say of the application of hot sealing-wax as a remedy to snake-poisoning? He would in all probability laugh at it as an absurdity, and he would be right. But there is a gentleman who advocates it, and moreover declares that he has proof of its efficacy from *observations on human beings.* A Bordeaux newspaper, "*Le Mouvement*," of the 30th of October 1871, has the following:—"*M. Hélidore, Ruiz, de Colombié (Nouvelle-Grenade) écrit au Gouvernement de cette contrêe, qu'il a traité avec le plus grand succès un grand nombre de morsures de serpents par la cautérisation. La province abonde en serpents dont la venin est mortel; or M. Ruiz a déjà guéri soixante-dix personnes mordues, en faisant couler simplement, sur chaque morsure quelques gouttes de cire à cacheter.*"

To the very same "undoubted facts," on which Dr. Halford assumes the efficacy of his treatment, do numerous other persons, none the less truthful, appeal, as confirmatory evidence in favour of their separate *antidotes.* How, then, can deductions based upon such data be considered anything but fallacious?

I trust Dr. Halford will regard this criticism of his mode of treatment in the light it is intended, *viz.*, as one of the means of ascertaining the truth. Dr. Halford has alluded to success having attended his experiments on dogs. Is he certain? Did he satisfy himself, beyond the possibility of a doubt, that in each case, from which he drew any deductions, the bite was a legitimate one? Did he hold, or have held, the snake and make it bite some soft vulnerable part of the dog? If not, his experiments, as a test of the efficacy of his treatment, are unreliable.

I hold it to be a *sine quâ non*, in testing the value of any remedy for snake-bite, that the bite shall be beyond all doubt a legitimate one; and so long as any doubt under this head exists, so long must the test as such be regarded as worthless.

Experiments on the influence of snake poison and on the injection of certain fluids into the venous circulation as antidotes and on the application of the ligature and actual cautery.

By J. Fayrer, m. d., c. s. i.

Present—Dr. Fayrer, Dr. Ewart, Professor of Physiology, and Mr. Sceva.—June 12th, 1869.

Experiment No. 1.

A fowl was bitten in the thigh by a spectacled cobra that had been kept in confinement for some weeks, had bitten before, and was, therefore, not fresh. The fowl was bitten at 3 p. m.

At 3-1-50.—Fowl staggering; fifteen drops of strong Condy's solution, furnished by Messrs. Scott, Thompson and Company, was injected with the hypodermic syringe into the fowl's thigh.

3-2-50.—Fell down paralysed.

3-4.—Lies almost dead; just breathing.

3-5.—Convulsed.

3-7.—Dead.

Death occurred in seven minutes; but the bird was evidently unconscious after the first 2½ minutes. I could not recognise any good effect from the injection.

Experiment No. 2.

The left crural vein of a dog was exposed, ready to receive the injection. The dog was then bitten by a cobra in the right thigh at 3-20 p. m. The cobra was not fresh, it had been in captivity for some time, and had bitten before; but it was tolerably vigorous.

3-23.—Dog is excited and restless.

3-24.—Same condition; whining.

3-27.—Much excited; trying to break loose; is salivated; breathing hurried.

3-37.—Is beginning to show signs of the influence of the poison; is slightly convulsed; falls over.

3-37-30.—Injected 60 drops of liquor ammoniæ sp. gr. ·959 into the crural vein; followed immediately by convulsive twitchings of mouth and limbs.

3-42.—Lying down, very low, almost motionless; irregular action of the heart; injected 40 drops more of the liquor ammoniæ.

3-43.—No change; heart's action very feeble.

3-44.—Lies perfectly still, as though dead: no respiration; heart beats very irregularly 35 pulsations in 30 seconds.

3-45.—Dead.

Post-mortem examination of body at 4-20 P. M. Lungs pallid; no congestion. Heart right side much distended with black clots. Left ventricle contained a little dark fluid blood. The viscera generally were pallid; but the liver was somewhat congested. Brain—cerebral substance free from congestion; vessels on surface slightly distended with blood. The blood generally coagulated firmly.

EXPERIMENT No. 3.

The external jugular vein of a dog was exposed at 3-34 P. M.; 40 drops of the liquor potas permanganat (Condy's) was injected into the vein at 3-35.

No effect produced at the time; the dog did not appear to take any notice of the injection.

3-40.—Dog apparently not affected.

3-45.—Seems rather depressed, but this is not marked; it may be fear.

3-48.—Bitten by a large cobra (not fresh, for it has been some time in captivity, and has bitten before) in the thigh. The fang punctures were at once washed with the Condy's solution, which was well rubbed in.

3-49.—Bitten leg partially paralysed.

3-50.—Lying down; when raised can stand, but quickly lies down again; is quite intelligent.

3-51.—Droops his head.

3-52.—60 more drops of the fluid injected into the vein.

3-54.—Two drams injected into the bowel; is able to sit or stand, but is very weak.

The injection of the Condy was not followed by convulsions, as in the case of the liquor ammoniæ.

3-58.—Lies down; head falls over; breathing hurried; rises and staggers a little and sits down again.

4 P. M.—Lies sluggish and dejected; can walk when raised, but staggers and soon sits down again.

4-5.—Can still stand and walk with staggering gait.

4-7.—Lying down, but gets up and walks a few steps; head drooping, and look dejected; twitching of muscles generally.

4-8.—When put on his legs can still stand; breathing hurried; coat staring.

4-12.—40 more drops injected into jugular vein.

Slight twitching of muscles generally; lies down on his side; cannot rise; limbs paralysed; pupils dilated; slight convulsions of extremities and muscular system generally; breathing catching and rather slow.

4-22.—Motionless; heart still beats 50 in the minute; no respiration.

4-24.—Heart still felt.

4-25.—Dead.

Bitten at 3-48; dead at 4-25; in 37 minutes.

Death occurred in about the usual time, and with the usual symptoms in which it occurs when a dog is bitten by a cobra. I do not believe the effects of the poison were in any way influenced by the permanganate.

Post-mortem at 4-40 P. M.—Lungs much collapsed and very pallid. Both sides of heart full of fluid blood; great vessels distended. The blood coagulated firmly when let out of the heart and vessels. Abdominal viscera not so pallid as in the other dog. Brain vessels on surface full of blood: cerebral substance pale, scarcely any puncta.

EXPERIMENT No. 4.

A fowl bitten by a cobra (not fresh) in the thigh at 4-45 P. M.; 20 drops of liquor ammoniæ having previously, at 4-43, been hypodermically injected into the thigh, no apparent effect produced by the ammonia thus injected. Bitten by the cobra at 4-45 P. M.; in 30 seconds it was in violent convulsions.

4-46.—20 more drops injected.

Dead before it could be placed on the ground.

EXPERIMENT No. 5.

The following experiments were tried with the object of again testing the effect of the Cobra poison on itself, or on another cobra.

A cobra was bitten sufficiently near the tail to avoid the chance of injuring any of the viscera by another full-grown, fresh, and vigorous cobra. The snake bit deeply, plunging its fangs twice or thrice into the flesh of the other cobra, which was then put aside in a separate cage, and watched.

13th, 6 A. M.	No change.
,, 7 P. M.	do.
14th, 6 A. M.	do.
,, 6 P. M.	do.
15th, 6 A. M.	do.

The snake evidently has not suffered.

Experiment No. 6.

A vigorous and fresh full-grown cobra, with one occellus in the hood (Keutiah of the natives) was made to bite himself three or four times near the tail at 4-48 P. M. He bit himself quite as freely as he would have bitten another snake, brought blood, and smeared the surface with poison; put into a cage and watched.

Was not the least affected on the 15th, three days after the bite.

These two experiments, which were very carefully performed, tend to prove that the cobra cannot poison itself or its own species.

Present—Drs. Fayrer, Ewart, Waller, and Mr. Sceva.— June 19th, 1869.

Experiment No. 7.

A full-grown cat was bitten at 2-43 P. M. in the right thigh by a large Daboia. The snake had been long in captivity, and was therefore most probably not vigorous, though active and vicious.

2-49.—Twitching of the muscles; restless.

3-12.—The cat appears to be unaffected.

3-15.—The Daboia again made to close his jaws on the cat's thigh, though evidently unwilling to bite.

3-44.—The cat seems sluggish, and is evidently now feeling the poison.

3-45.—Bitten by a cobra on the thigh.

3-46.—The cat is unsteady in its gait; breathes hard; looks distressed.

4-7.—Cat is restless; tries to rise, and staggers.

4-10.—Tries to stand, but falls over.

4-18.—Respiration very hurried; cannot stand; twitching of the muscles.

4-24.—Lies quite paralysed; pupils dilated; breathing hard.

4-27.— Convulsed.

4-30.—Dead.

The cat was bitten by the Daboia at 2-43 P. M., and again at 3-15. The snake was old and feeble; it has been in captivity for more than six months, during which time it has touched neither food nor water, and yet it was active and vicious, hissing fiercely at any one who came near it; that it was capable of secreting poison was evident in later experiments.

The cobra bit at 2-45; and death occurred at 4-30; that is, in one hour and forty-seven minutes. The cobra was also not fresh, and its poison was weak, perhaps scanty. There was nothing whatever in this experiment to make us think that the cobra's poison proved antidotal to that of the Daboia; on the contrary, it rather expedited death.

Experiment No. 8.

A fowl was bitten in the thigh by the same Daboia at 3-40. The snake would not bite until his jaws were closed on the bird's thigh.

3-44.—The fowl, whilst walking about with rather a sluggish gait, suddenly sprang off the ground, and fell over in convulsions. It was immediately bitten in the thigh by a cobra. It continued unconscious and convulsed, and was dead at 3-46; that is, in six minutes after it was bitten by the viper. Had this viper been fresh, the bird would probably not have lived one minute.

Experiment No. 9.

Another fowl bitten by the same Daboia at 3-56 P. M.

3-58.—It limps; has a depressed look, and its comb droops.

3-59.—Bitten by a cobra in the thigh; lies down.

4-2.—Slight convulsions.

4-3.—Comb livid; convulsed and unconscious.

4-5.—Dead in nine minutes.

These three experiments, I think, dispose of the question of the poison of one family of venomous snakes being antidotal to the other.

In these cases the viper was old and exhausted, and yet his poison was deadly. The poison of the cobra, which was also a partially exhausted snake selected on purpose, had no counteracting effect. The only thing proved is the terribly deadly nature of the Daboia, which, after such long confinement without food or water, yet retained the power of causing death.*

These experiments were made in reference to certain suggestions that have appeared in the journals, but not with any expectation on my part that any other result than that which occurred could take place. The poison of the deadly snakes, of whatever family, kills by paralysing the nerve centres, and it appears as reasonable to expect prussic acid to prove antidotal to aconite, as the cobra poison to be so to that of any other form of venomous snake.

Experiment No. 10.

A fowl was bitten by the same Daboia in the thigh at 4-7 P. M.

4-10.—Sitting down; looks sluggish.

4-15.—Rises and runs about, but is lame.

4-27.—Walks, but is very lame on the bitten leg.

4-45.—Still walks about, but is sluggish and lame, and looks very dejected.

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* The Daboia was not intentionally deprived of food or water; it would take neither.

The fowl, after this, began to recover, and on the 21st, two days later, was quite well. The snake was evidently all but quite exhausted when he bit this bird.

EXPERIMENT No. 11.

The external jugular vein of a dog was exposed at 3-6 P. M., and four drops of cobra-poison were injected; at least one drop was lost, the other three entered the vein.

3-10.—Dog looks dejected, and ears drooping; he lies down.

3-33.—Beyond being sluggish, no symptoms of poisoning.

3-46.—Very sluggish; lies down.

3-47.—Liquor ammoniæ, sp. gr. ·959, 60 drops, injected into jugular vein; dog lies quiet. Heart beating rapidly; respiration very feeble.

3-54.—Heart's action very rapid; breathing rapid; muscular twitchings.

3-57.—Injected 60 more drops into the vein; muscular twitchings continue.

3-59.—Dead.

Poison injected at 3-4; death at 3-59. Death in 55 minutes. The quantity of poison was very small from a weakened snake; no effect was produced by the ammonia.

EXPERIMENT No. 12.

The jugular vein was exposed in a dog; it was then bitten in the thigh by a fresh cobra at 3-27.

3-28.—Staggering; excited; springing; howling violently, and trying to break the cord by which it is tied.

3-29.—Quiet; sitting down.

3-30.—Head drooping.

3-33.—Lying on its side, slightly convulsed; sixty drops of a solution of quinine, of the strength of one grain in eight drops, was injected into the jugular vein.

3-34.—The dog lies on its side, still slightly convulsed.

3-35.—Dead.

Bitten at 3-27; dead at 3-35, in eleven minutes. The quinine evidently did no good.

EXPERIMENT No. 13.

Equal parts of cobra-poison and liquor ammonia, sp. gr. ·959, were mixed together, and fifteen drops of the mixed fluid were injected with the hypodermic syringe into a pigeon's thigh at 4-30 P. M. Pigeon crouched immediately; at 4-31 was unable to stand; the beak resting on the ground.

4-32.—Convulsed: peculiar convulsive movements of the tail continuing.

4-32.—Dead.

Injected at 4-30; death at 4-32, in two minutes. This experiment is very unfavorable to the theory of the antidotal action of liquor ammoniæ.

EXPERIMENT No. 14.

The external jugular vein of a large and powerful dog having been exposed, 10 drops of fresh cobra-poison were injected into it at 4-24 with the hypodermic syringe.

4-24-30.—The dog staggered, was convulsed, and fell over foaming at the mouth.

4-25.—Violently convulsed, but with no outcry or sign of suffering.

Sixty drops of liquor ammoniæ, sp. gr. ·959, injected. Dead.

Death occurred in about 70 seconds, showing the frightful virulence of the poison when it finds entry by a large blood vessel.

How can such a death be explained otherwise than by exhaustion of the nerve centres? Any theory of blood-change is surely totally inapplicable here.

Present—**DR. FAYRER, DR. EWART, Professor of Physiology, and DR. SCEVA.—June 26th, 1869.**

EXPERIMENT No. 15.

A pariah dog was bitten in the fore-arm by a cobra (Kalla Keutia) at 3-2 P. M.

A ligature had been thrown round the limb above the bitten part, which was immediately tightened; a pointed steel, heated to a red heat, was then, at 3-3 P. M., inserted into the punctures, and the wounds were thoroughly cauterized.

3-7.—The dog is restless, and is apparently under the influence of the poison.

3-12.—Staggers as he walks.

3-14.—Forty drops of liquor ammoniæ, sp. gr. ·959, diluted with three parts of water, were injected into the jugular vein.

3-17.—The dog runs about excited; he was partially convulsed during the injection of the ammonia; now sits up, and then falls over backwards, breathing quickly.

3-20.—Lies down; is salivated.

3-27.—Sits down; paws the air; muscular twitchings.

3-38.—Lying on his side; convulsed.

3-44.—Lies paralysed; heart still beats, but no respiration.

3-45.—Dead.

Notwithstanding the ligature, which was tightened immediately, the actual cautery, which also immediately followed the cobra's fangs, and the injection of ammonia into the venous circulation, the snake-poison proved fatal to a full-grown dog in forty-three minutes.

EXPERIMENT No. 16.

A dog was bitten by a fresh cobra (Kalla Keutia) in the fore arm at 3-38 P. M.; a ligature was immediately tightened round the limb above the wound. The actual cautery was at once applied, until the fang wounds and the adjacent parts were completely disorganized.

3-42.—The dog is sitting, but reels as though he would fall over.

3-49.—Rises and walks with a staggering gait.

3-54.—Sits down; attempts to get up, and falls over backwards.

3-57.—Is convulsed; falls over; cannot stand; hurried breathing.

4-4.—Cannot move; lies paralysed; heart still beating; respiration almost ceased; pupils widely dilated.

4-6.—Lies on his side; convulsed.

4-12.—No respiration; but heart still beats feebly.

4-13.—Dead.

In this case also, notwithstanding the ligature, which was applied as tightly as two persons could pull it round the leg, and the deep and thorough actual cauterization, immediately after the bite, the snake poison found entry into the system, and proved fatal in thirty-five minutes. The dog was much smaller than that of the first experiment.

Nothing, it seems to me, can more strongly demonstrate the extremely subtle and virulent nature of the cobra-poison than those experiments; nothing, I think, is more significant of the improbability of anything proving to be an antidote. If the poison find entry into the blood vessels, and be carried to the nerve centres, I am inclined to believe that nothing can prove of any avail, excepting in those cases where the bite is imperfect, the quantity or the quality of the poison diminished or deteriorated, or the snake itself is young, weak, exhausted, or is one of less poisonous family; such, I believe, are the only cases in which recovery occurs through the inherent vigour of the animal or person bitten, perhaps, aided by stimulants and excitement. The favourable result is attributed, and naturally enough, by those who do not understand the *modus lædendi* of the venom, to the treatment and the so-called antidote. That we can aid in such recoveries, and that we may do much to help the sufferer through the troubles arising from general disorder and secondary blood poisoning, I have no doubt; and I would offer every encouragement to all to persevere in their attempts. But I must state my conviction that nothing that can properly be called an antidote to cobra or viper poison exists; and the more this is known the better, for mistaken notions on such an important matter can only do harm, and may be the cause of losing rather than of saving life.

My belief is that, if an animal, and probably a man, be fairly bitten by a fresh and vigorous cobra or Daboia, it, or he, will inevitably succumb, unless some immediate and direct method of arresting the entry of the poison into the circulation be practised.

That such may be done, I will not deny; but the two experiments just recorded, performed with the greatest care and speed by two Surgeons accustomed to such operations, show that, at the least, it is very difficult. The moment of time that intervenes between the injection of the snake-poison by the powerful maxillary muscles through the tube-like fang into the minute blood vessels of the part, and the application of the ligature and actual cautery, is sufficient to allow of the entry of the poison into the circulation, and this reaching the nerve centres even in a small quantity may prove fatal. The ligature is evidently very unreliable when applied to large parts of the body, such as the limbs; for it is almost physically impossible to compress the part so tightly as to stop the circulation; and unless this be done to the depth of the penetration of the snake's fangs, it is obvious that it can only be of very partial effect in preventing the entry of the poison. On a finger or a toe the ligature might be of more service, as the smaller part might be thoroughly strangulated; but unless the ligature were applied immediately, it is obvious that it would be useless even there, for the poison would have already entered, and be on its course towards the nerve-centres. How quickly this occurs is proved by those experiments in which the poison was injected directly into the jugular vein. What took place there, with the hypodermic needle inserted into the jugular vein, has its exact counterpart in the case of the cobra's fang, inserted, as it must be, when it penetrates a vascular part, into the minute veins.

The same may be said of the actual cautery. Unless the hot iron enter the puncture directly after the fang has been withdrawn, the poison is already far on its way towards the centre, and the burning, though it destroys the tissues and such of the poison as may not yet have entered the circulation, can have no influence on that which is already beyond its reach.

But as the ligature, if tightly and quickly applied, and the actual cautery, if promptly and and thoroughly inserted, must limit to a certain extent the entrance of the poison, both should be had recourse to as speedily and efficaciously as possible, in the hope that the amount of poison left to find, or that may have already found its way into the system, may be less than is sufficient to cause death.

To conceive of an antidote in the true sense of the term, to snake-poison, one must imagine a substance so subtle as to follow, overtake, and neutralize the venom in the blood, or that shall have the power of counteracting and neutralizing the deadly influence it has exerted on the vital forces. Such a substance has still to be found, and our present experience of the action of drugs does not lead to hopeful anticipation that we shall find it.

But I repeat that, where the poisonous effects are produced in a minor degree, or when the secondary consequences are to be dealt with, we may do much to aid the natural forces in bringing about recovery. This is not, however, what is meant by an antidote.

Experiment No 17.

A large and powerful dog had the right external jugular vein exposed. Twenty drops of a mixture of fresh cobra-poison, taken from the snake the same day, one part, and liquor ammoniæ, sp. gr. ·959, forty drops or two parts, was then injected with the hypodermic syringe into the vein. The time of the insertion of the fluid was 4-27-30. The effect was instantaneous; the dog struggled, howled, and was convulsed on the table; he was immediately released and placed on the ground, but was already almost unconscious and convulsed. He made an effort to rise on his legs, and fell prone on his belly. Within one minute respiration had ceased, though the heart's action continued faintly. This ceased, and at 4-30 A. M. he was quite dead. The action of the poison with the ammonia was frightfully rapid in this case. Death occurred in two minutes and a half; complete unconsciousness within a minute; and only by the faint beating of the heart, which only continued for two and a half minutes, was any sign of life manifested. This surely is fatal to the theory of ammonia injected into the circulation being of any benefit in snake-poisoning. In this case the poison and the so-called antidote were injected synchronously; the result was almost instant death.

The experiment was performed by Dr. Ewart and myself, with the greatest care, and certainly no air entered the vein.

Experiment No. 18.

The cobra that bit the dog in the first experiment bit a fowl in the thigh at 3-46 P. M. The bird immediately began to limp, and then crouched, and then fell over.

3-47.—Head fallen over, beak resting on the ground.

3-49.—Convulsed; dead.

Death occurred in three minutes.

A second fowl was bitten by the same snake, at 3-50 P. M., in the thigh.

3-51.—Drooping his wings.

3-55.—Sits down, beak resting on the ground.

3-57.—Is convulsed.

4. P. M.—Dead in ten minutes.

A third fowl bitten by the same snake in the thigh at 3-51 P. M., shortly after drooped.

3-58.—Convulsed.

4-2.—Dead.

Dead in 11 minutes.

A fourth and larger fowl bitten in the thigh by the same cobra at 4-3 P. M.

4-8.—Crouching; wings spread out; gets up; tries to run, and falls; head droops, beak resting on the ground.

4-10.—Convulsed, 4-17.—Still convulsed; comb livid.

4-20.—Dead in 17 minutes.

A fifth fowl bitten in the thigh by the same cobra at 4-13 P. M. 4-20.—Crouches; comb drooping.

4-24.—Head drooping, resting on beak. 4-29.—Quite paralysed; convulsed.

4-35.—Dead in 22 minutes.

A pigeon was bitten in the thigh by the same cobra at 4-37 P. M.

4-47.—The pigeon is drooping, and, when he stands, it is on one leg, and then falls over again.

5-22.—Dead in 45 minutes.

This was the ninth animal bitten by the cobra in rapid succession, and still it is apparently not quite exhausted.

A sixth fowl bitten in the thigh by the same cobra at 4-32 P. M.

4-35.—Crouching. 4-47.—Staggers.

5-45.—Lying down insensible.

6-5.—Dead in 99 minutes.

A seventh fowl bitten by the same cobra in the thigh at 4-34 P. M.

4-37.—Crouches. 4-47.—Seems sluggish, and limps.

27th June, 5-30 A.M.—Lying down, and eyes half closed; unable to walk.

28th June, 6 A. M.—Is recovering; walks sluggishly and limps, but is evidently regaining strength.

The object of this experiment was to test the extent of power possessed by the cobra. It destroyed one dog, six fowls, and a pigeon in rapid succession, but the intervals between the bite and the death of each was prolonged, showing the gradual diminution of power at each bite. The seventh fowl poisoned was only slightly so, and recovered.

The cobra was neither a very large nor a very vigorous one, and yet how deadly! Eight creatures destroyed by a rapid succession of bites. The experiment proves that the snake becomes weaker by biting until quite exhausted.

Experiment No. 19.

A Daboia was bitten by a fresh cobra (Kalla Keautia) near the tail, sufficiently far from the viscera. The scales were previously scraped off. The snake bit fiercely and repeatedly at 4-54 P. M.

6 P. M.—No change.

On the 28th June, at 6 A. M., there was no change.

The object of this experiment was to repeat the test of the influence of the cobra-poison on the viper. The result tends to show that it is innocuous.

Dr. Shortt, Superintendent General of Vaccination, Madras, who had interested himself in the treatment of snake-bites for several years, was asked by the Government of Madras to give his opinion on the subject. The following are his remarks:--

From the ancient repute that ammonia and its preparations have had as an antidote, I tested it repeatedly and carefully on several occasions in the following manner:—

I. By mixing liquor ammoniæ with the cobra poison, and injecting it hypodermically into animals.
II. By injecting liquor ammoniæ itself, hypodermically, into snake-bitten animals.
III. By administering the liquor ammoniæ by the stomach and bowels to snake-bitten animals.
IV. By the injection of liquor ammoniæ, as suggested by Professor Halford, into the veins of snake-bitten animals, and I regret to state that, notwithstanding the utmost care and repeated experiments on the lower animals, the ammonia failed completely to restore such animals to life.

In addition to the various experiments conducted by myself at different times and places, on the 14th January at my house in Madras, before Dr. Mackenzie, the late Inspector General, Indian Medical Department, and some twenty Medical Officers, and at the Madras Medical College Theatre, on the 29th January 1870, in the presence of most of the Professors of the College, several Medical Officers, students, and other gentlemen, I demonstrated to their satisfaction, I believe, by experiment on animals the complete failure of the liquor ammoniæ as an antidote by injection into a vein.

My experience of the liquor ammoniæ as an antidote by injection into the veins is simply confined to the lower animals, as I have not had the opportunity of testing it in man; but the uniform evidence given of its success by some twenty medical men after trial on the human subject in Australia, as given in this pamphlet, startles me at the miraculous cures said to be effected, as moribund patients have not only recovered, but were, upon their legs, able to partake of food and walk off to their houses after recovery from the snake-poison in an incredibly short time.

Dr. Halford, in the pamphlet alluded to, enters largely on the hypothetical action of ammonia in the human system; and however ingeniously argued, this is a mere matter of theory, into which it is not my province to enter, as I prefer confining myself to practical facts, the result of my personal experiments.

The result of my experiments on the poisoned blood in testing it, both physically and chemically, proves that the poison enters the system and destroys the integrity of the blood in snake-bitten animals when they have been fairly bitten and a due proportion of poison injected into the wound, and any antidote to prove effective must be capable of overtaking the poison in the blood as it circulates in the living system and there neutralize it chemically, for this is the only way in which both facts and experiments tend to confirm.

The liquor ammoniæ has universally been used as a diffusable stimulant generally, and therefore recommended in snake-poison; but, as far as my personal experience extends, it does not seem to be of any particular value, as I consider brandy a more reliable remedy; from being a powerful stimulant, it tends to support the system where freely administered, and rapidly enters the circulation, rouses up the nervous energy rendered dormant by the poison, and admits of time for the administration of a chemical remedy, should such exist.

Dr. Halford states at page 11 of his pamphlet that "ammonia and brandy thrown into the system is not absorbed;" this is contrary to my experience in the cases that have come under my immediate notice. I have had no difficulty in bringing the system under the influence of brandy by frequent doses administered by the mouth and bowels where necessary, so as to bring the snake-bitten patient rapidly under its influence; and at page 18 Dr. Halford admits "that liquor ammoniæ has no chemical action over snake-poison."

It further strikes me that, if even the ammonia really proves so valuable a remedy, the injection of it into the veins can be undertaken by very few non-professional persons in the absence of a Surgeon, as they will not possess the *nerve* or the skill to free a vein and introduce the nozzle of a syringe into it, and it is stated that "the parts slough if the ammonia be spilt."

Liquor ammoniæ and brandy have been fairly tested in the human subject for the snake-bite, and the hypodermic injection of the ammonia also, but it has never as yet been injected into a vein; this has yet to be tried in man, whilst it completely failed in the lower animals, not only in my own experiments, but in that of other medical men in Calcutta.

In conclusion, I would remark, with reference to that part of Dr. Halford's experiments as given in the above pamphlet, where the ammonia was injected into the heart of dogs, not only to prove its innocuousness, but also its power of counteracting the narcotic effects of chloroform, that these experiments appear to me inconclusive, as the animals were not permitted to live sufficiently long to ascertain any deleterious action the liquor ammoniæ may have produced on them: this is absolutely necessary ere pronouncing so confident an opinion as that given by Dr. Halford.

The following is the abstract of the opinions of certain Medical Officers in the Punjab, who were consulted on the subject by the local Government.

Dr. Willmot, Medical Officer of Gurgaon, states that during the month of September 1871 a case of snake-bite came under his observation. It was that of a tailor boy, about 14 years of age, who had been bitten in the finger by a small brown-colored snake, called by the natives "Haffai," but most probably a "Krait." No treatment was of any avail, and the boy died about 20¾ hours after he had been bitten. Ammonia and other stimulants were given with milk, and, after parts affected had been punctured, was also applied to the skin. A ligature was tied round the wound when the boy was admitted, and he was kept awake as long as possible. Dr. Willmot is of opinion that all treatment in this case was useless, and inclines to the belief that the only treatment likely to be useful in similar cases would be to exhaust the air external to the wound by cupping-glasses, or, better still, by sucking the wound immediately after infliction. In the present case cupping-glasses could not be applied, as the part bitten was the finger.

Dr. Cooper states that he has not had an opportunity of testing Professor Halford's method of treatment in cases of snake-bite, but will do so when he has, as he believes that the injection of ammonia into the blood will prove successful.

Dr. Massey, of Jullundur, holds that the numerous experiments made by Dr. Fayrer at Calcutta prove that there is no known antidote for the poison of a venomous snake. He considers that the safest, and probably the only reliable, remedy in snake-bite is immediate excision, and application of strong nitric acid to the wound, together with stimulants, and all other remedies calculated to support the system while throwing off the poison.

Dr. Cox, of Muzaffurgarh, states that he has no opinion to offer, as the plan of treatment advocated has not been tried; but from the fact that slight cases of snake-bite were relieved by the internal use of liquor ammoniæ, he believes that the hypodermic use of the medicine would effect all the results attributed to it by Professor Halford.

Dr. Castello, of Derah Ismael Khan, has no opinion to offer, as he has not tried the treatment advocated. He, however, states that he has tried advantageously the internal use of ammonia after excision and cauterization of the bitten part and neighbourhood.

The Resident at Hyderabad consulted Dr. J. C. Howard of Oomraotee and Dr. A. Porter of Akola, and the following is an abstract of their opinions:—

Dr. Howard states that, since the receipt of the circular and pamphlet, no cases of snake-bite have been brought to any of the dispensaries in Oomraotee, and that, consequently, no special report can be made from practice there. He, however, adds, from his own experimnts and observations, that neither ammonia nor liquor potassa administered internally, nor transfusion, will be found a specific for the cobra bite. What liquor potassa or ammoniæ may do for the bite of the diamond or tiger-snake of Australia he cannot say; it may be that the virus of these snakes is less deadly than the Indian cobra, but it is certain that all the experiments with these two drugs in India by Dr. Shortt and many other medical men have had little success. Given by a young, strong, 15 months' cobra, with his poison sac well filled, himself thoroughly aroused through irritation, his fangs entire and his bite perfect, with a twist of his neck and head, and a delay of from 5 to 7 or 10 minutes, before excision, cupping, and stimulants can be adopted, Dr. Howard asserts most positively the bitten individual will be a dead man. The so-called cure for snake-bites (cobra) is purely a myth, and may be attributed—*1st*, to the reptile having had its fangs broken or destroyed by fighting or biting some tough objects; *2nd*, to the poison sac being empty, the virus having been expended, and the reptile exhausted.

The cobra (supposing the bite to be from a reptile of that class, which is in numerous cases supposed, and not substantiated by fact) may bite, but not effectually; the cobra may raise its hood and head, and, darting forward, strike the object, and most probably nip without ejecting the poison, which fact can only be judged by the vicious mouthful the reptile takes, and the twisting of its head and neck generally to the right side, at which moment the poison is ejected by pressure on the sac, along the duct through the hollow fangs into the wound. The only remedy is excision, free and full, ligatures between the heart and the wound, suction by the mouth or cupping, the application of ammonia or liquor potassa to the wound, and free stimulants even to semi-intoxication, *but these measures must be adopted before the poison has completed the round of the circulation*, and the delay will considerably affect the results.

Dr. Howard adds that he has had no experience in the hypodermic measures and transfusion of remedial agents, such as ammonia and liquor potassa, and he is not therefore prepared to give a satisfactory opinion, but, judging from analogy, he says that any great delay in the adoption of these measures must be fatal to the bitten individual, and their action must be stimulant, and not specific. The backwoodsmen of America, when bitten by a poisonous snake, make up gunpowder with water into what is commonly designated a "devil," which, like the surgical "Mosca," is placed over the part and set fire to, thereby destroying a considerable portion of flesh and the poison always, provided the measure is used quickly and in time.

Dr. Porter, of Akola, states that a number of recoveries from snake-bite are recorded in this pamphlet after the injection of ammonia into the veins, but there is nothing to show that the persons bitten would have died if left without treatment. On the other hand, Dr. Fayrer of Calcutta and Dr. Shortt of Madras have shown by repeated experiments that animals effectually bitten by the poisonous snakes of India die as surely under the above treatment as if left alone.

No. $\frac{3366}{75G}$, dated the 23rd August 1872.

From—The Hon'ble E. W. Ravenscroft, Acting Chief Secretary to the Government of Bombay,
To—The Officiating Secretary to the Government of India, Home Dept.

With reference to Mr. Under-Secretary Wellesley's letter No. 2935, dated 19th ultimo, I am directed to state, for the information of the Government of India, that the Inspector General, Indian Medical Department, has reported that no opinions on the subject of Dr. Halford's treatment of snake-bite have yet been received from the Medical Officers of this Presidency.

In Bombay itself, very few cases have been admitted into the hospitals for treatment, the natives having no faith in our remedies, and preferring recourse to charms. In one instance, Professor Halford's plan of injecting ammonia into the veins was tried without success. As, however, instructions have been issued to treat every case of snake-bite by injecting ammonia, it is hoped that further proofs of its effects may hereafter be collected.

No. 349A, dated the 7th February 1872.

From—C. A. Elliott, Esq., Officiating Secretary to the Government of the North-Western Provinces,
To—The Secretary to the Government of India, Home Dept.

In reply to your letter No. 3153, dated the 27th June last, I am directed to state that the 25 copies of the pamphlet by Professor Halford, of the Melbourne University, on the treatment of snake-bite, therewith forwarded, were distributed to the gentlemen named on the margin, who were requested to report whether, in their opinion, the remedy proposed would be efficacious in this country.

Dr. Hilson, Bijnour.
Mr. Edwards, Commissioner, Jhansie.
Dr. Tomkyns, Bareilly.
" Watson, Almorah.
" Planck, Sanitary Commissioner.
" Jameson, Allahabad.
" Grant, Futtehgurh.
" Garden, Saharunpore.
" Waghorn, Mirzapore.
" Hinton, Moozuffernuggur.
" Prentis, Goruckpore.
" Sherlock, Etawah.
" Loch, Bareilly.

Dr. Jones, Allahabad.
" Christison, Agra.
" Cockburn, Benares.
" Harris, Shahjehanpore.
" Collison, Moradabad.
" Condon, Cawnpore.
" W. Moir, Meerut.
" Smith, Nynee Tal.
" McDermott, Banda.
" Milne, Bareilly.
" Hooper, Benares.
" Pilcher, Agra.

2. These officers have now replied, but none of them have any practical knowledge of the subject, except Drs. Hilson and W. Moir, whose reports I am to submit for the information of the Right Hon'ble the Governor General in Council.

3. The other gentlemen consulted refer generally to the failure of the experiments made by Dr. Fayrer to test the same remedy, and to the difficulty of applying the proposed remedy, if found beneficial, by any but practical hands, on account of the delicacy of the instruments required, but they all think that further experiments on its efficacy should be tried.

No. 254, dated the 6th December 1871.

From—A. H. Hilson, Esq., M. D., Officiating Civil Surgeon, Bijnour,
To—The Officiating Secretary to the Govt., N. W. Provinces.

I have the honor to acknowledge receipt of your letter No. 4547 A, dated 16th October 1871, together with a copy of a paper read by Professor Halford before the Medical Society of Victoria, on a new remedy for snake-bite, on which you desired to have my opinion.

2. I have not had any opportunity of trying it on the human subject, but have recently made some experiments on the lower animals, with a view to test the efficacy in cases of cobra bite, and the result I now beg to submit.

3. My observations have been limited entirely to the bites of the cobra di capello, which, besides being the best known, and, perhaps, the most deadly of all the venomous snakes in the North-Western Provinces, is the cause of more mortality than any other species.

4. The krait (bungarus cœrulous) and one or two others, though reputed to be almost as deadly as the cobra, are seldom met with, and are not well known to the natives generally.

5. Ammonia in some form or other, but chiefly as eau de luce, has been the standard antidote for all kinds of snake-bites for upwards of a century, and has hitherto been administered internally by the mouth. Dr. Richardson, of London, a few years ago showed that it could be injected with safety directly into the circulation; but it is to Professor Halford that belongs the merit of having first suggested this mode of administration to counteract the influence of snake-poison on the system.

6. Judging from the number of successful cases recorded as having occurred in Australia, it was to be expected that some benefit would follow the application of the remedy in India; but, as far as I have been able to try its effects by experiments on the lower animals, including the dog, the goat, and the ass, it does not seem to have any power of averting, or even of retarding, the accession of fatal symptoms after cobra bite.

7. In some of these experiments, an account of which is appended, the ordinary liquor ammoniæ of the British Pharmacopœa was used, and in others the liquor ammoniæ, *à fortiori*, of specific gravity, 891, procured for the purpose from the Medical Depôt at Allahabad.

8. It was injected both before and after the toxic action of the poison had manifested itself on the system, and sometimes the injection was repeated several times before death, yet the only effect ever produced was a temporary acceleration of the heart's action.

9. I have also been unable to verify Professor Halford's observations on the changes said to take place in the blood from the presence of the snake-poison.

10. He alleges, *1st*, that the blood loses its power of coagulating, and argues from this that the poison causes a decrease of one of its constituents, the fibrine; *2nd*, that the white cells of the blood become more numerous, enlarged, and nucleated.

11. Dr. Fayrer's recent experiments have demonstrated that the coagulability of the blood is only destroyed by the poison of the viperine class of snakes, while that of the colubrine class, to which the cobra belongs, does not possess this power.

12. This accords with my own experience, for I invariably found that the blood coagulated firmly after exposure to the air, showing that the cobra poison at least exercises little influence in diminishing to any appreciable extent either the quantity or the vitality of the fibrine.

13. But even if the blood remained fluid, it would scarcely be possible to found any special argument on such a coincidence, because a similar fluidity is often observed after death from lightning, from many narcotic poisons, and, in fact, from any obstruction of the respiration.

14. The changes which the white cells of the blood are said by Professor Halford to undergo *after cobra bite* have been described by him in the *British Medical Journal* (July 20th, 1867), where a diagram of them is also given. But the metamorphosed condition of these cells, he says, is not easily seen, and often escapes the eye of good microscopists.

15. In all my experiments the blood was carefully examined with a microscope magnifying 530 diameters, sometimes during the life of the animal, sometimes immediately after its death, and sometimes several hours subsequently, yet I must confess that any enlarged or nucleated white cells I never could detect.

16. On the contrary, these bodies could nearly always be seen presenting their normal appearance and dimensions, and existing in their proper numerical proportion to the red corpuscles. In only one instance did they ever seem to be slightly increased in numbers. I failed also to see any change in the blood of the goat, the white cells of which are very conspicuous objects in the field of the microscope, owing to the small comparative size of the red corpuscles in that animal ($\frac{1}{6366}$ of an inch in diameter.)

17. Regarding the *modus operandi* of the remedy, Professor Halford does not explain his views very clearly. While admitting that it is not a chemical antidote, he suggests that by acting as a powerful central and peripheral stimulus, it puts a stop to certain molecular changes which he supposes to be going on in the blood.

18. That any such changes occur at all is an hypothesis, in support of which no facts are adduced, and it is evident, from the importance which he attaches to the stimulation of the heart or central organ, that he regards this as the main object to be attained in effecting a cure.

19. The question, therefore, arises—does a person bitten by a snake die from the paralysing influence of the poison on the heart? Because, if not, it seems superfluous to stimulate that organ.

20. That the heart's action is depressed when the patient becomes comatose cannot be doubted; but it appears to me that the *cobra poison* exercises its baneful influence chiefly on that part of the cerebro-spinal system from which proceed the molos nerves of the voluntary muscles, including those concerned in the act of respiration.

21. Any one who watches attentively an animal dying from cobra bite cannot fail to observe that paralysis of the voluntary muscles first sets in, and that the pulse, although it may intermit, beats with considerable force almost to the last, and for some minutes after the respiration has completely stopped. Moreover, when the thoracic viscera are subsequently examined, they present all the characteristic signs of death from asphyxia in a most marked degree.

22. In the case of the Keeper at the Zoological Gardens, London, who was bitten by a cobra in 1852, the Medical Officers of the University College Hospital, where he was brought for treatment, regarded the paralysis of the limbs and the difficulty of breathing as the most alarming of all the symptoms, and at once resorted to galvanism and artificial respiration.

23. This man was bitten on the bridge of the nose. "When brought to the hospital about half an hour after the accident, he was apparently dying, being unable to speak, livid, the heart's action feeble, and he was scarcely conscious. After death, which took place in little more than an hour, the right cavities of the heart were loaded with dark blood, the left being empty; indeed, all the phenomena of asphyxia were strikingly marked."—(Erichsen's Science and Art of Surgery, page 146.)

24. It is the same in the lower animals, in which paralysis of the voluntary muscles, and consequent difficulty of breathing, commences long before consciousness is obliterated, and before the heart is enfeebled to such a degree as to be incapable of performing its functions with economy.

25. Viewing, therefore, the rapidity of the action of the cobra poison on the medulla oblongata and spinal cord as the chief characteristic of that poison, while the higher encephalic ganglia are only secondarily involved, let us see how the bite of an Australian snake affects the system.

26. I have had no experience with the snakes of that country; but, judging from the 20 cases recorded in Professor Halford's paper, it is evident that the influence of their poison is excited chiefly on the cerebrum, producing deep insensibility or coma. It will be observed that in only one of these 20 cases, the 14th, is any mention made of paralysis; and Professor Halford, at page 9, in describing the symptoms, does not allude to any action of the poison on the medulla oblongata or spinal cord. "In all the cases," he says, "brought before you to-night, the functions of the cerebral ganglia and higher sensorium were completely in abeyance, or for a time extinct;" in other words, the functional activity of the cerebrum and ganglia of the special sense was entirely suspended.

27. It is doubtless this difference in the action of the two poisons that accounts for the success that has followed the ammonia treatment in Australia, and its failure in this country.

28. Professor Halford asserts his belief that equal quantities of snake-poisons are equally virulent, no matter to what species the snake may belong; but the fact remains that the cobra-bite usually proves fatal in less than three hours, while persons bitten by Australian snakes generally survive 8, 12 or even 27 hours (*vide* cases 8, 18, and 19), and sometimes the symptoms of poisoning do not supervene for 12 hours after the bite has been inflicted (*vide* case 19).

29. We may infer, too, that the various kinds of snake-poisons differ not only in point of virulence, but also in their mode of affecting the system; for we find the cobra unable to poison itself, or one of its own species, while the rattlesnake possesses this power; besides, the train of symptoms which ensue from the bite of the latter are essentially different from those produced by the cobra.

30. The stimulation of the heart by injecting ammonia into the veins cannot possibly be of the least service if the respiration is in any way obstructed; for it is well known that unoxydised blood passes with great difficulty through the pulmonary capillaries, and for this reason I think the remedy will never prove successful in cases of cobra-bite. We must always bear in mind the maxim of Cullen—"to obviate the tendency to death,"—and the tendency to death by cobra-bite is undoubtedly by asphyxia.

31. But even were the remedy of undoubted efficacy, it is not likely that it would ever be of much practical utility in a country like India, because its administration requires the use of a delicate instrument handed with some professional skill, and the great mass of the people are a long way removed from proper surgical assistance; besides, the cobra-bite proves so rapidly fatal (generally in less than three hours and often in one) that the sufferer has little time to seek medical aid.

32. All the antidotes which have hitherto been proposed for this dangerous affection are essentially empirical, and aim at neutralising the poison while it is circulating in the blood. The injection of ammonia is also intended to effect this end indirectly by stimulating the heart.

33. With the exception of arsenic, when given in ceslum skin diseases, we scarcely possess any therapeutic agent that has the power of destroying a poison circulating in that fluid, and in nearly all diseases in which the blood is contaminated with a *materies morbi*, we endeavour to eliminate it from the system by stimulating the excretory organs to increased action. This, however, cannot be done in most cases of snake-bite in India, because the powers of life are so rapidly overwhelmed that there is no time for the natural efforts of the system to come into play.

34. Local treatment, such as excision of the bitten part, or the application of a powerful escharotic when speedily resorted to, may be attended with some degree of success, as Professor Fayrer has shown; but all internal remedies have hitherto failed.

35. Experiments Nos. 7 and 11 were made with a view to test the efficacy of two so-called antidotes which were sent to me,—one by a Native, and the other by a European: both were found perfectly inert.

36. If ever any remedy is discovered, it will probably be found to consist of some substance producing on the nerve centres an effect directly antagonistic to that of the snake-poison, and there can be little doubt that recent researches on the action of opium in cases of poisoning by *datura*, and of the calabar bean in poisoning by strychnine, point out the right path to be pursued by any one in search of the much-desired antidote.

Experiments to test the efficacy of injecting liquor ammonia into the veins in cases of snake-bite, by A. H. HILSON, ESQ., M. D., *Officiating Civil Surgeon,—dated Bijnour, the 6th December* 1871.

1st experiment, 18th September 1871.—At 8-19, a healthy, young full-grown pariah dog was bitten on the nose by a large and vigorous spectacle-marked cobra. On being taken away from the snake he stood for about a minute, and then lay down and commenced licking the bite with his tongue. He remained in this state for about 12 minutes, apparently quite unaffected by the poison, but never attempting to rise.

8-33 A. M.—He became restless, frequently changing his position, but never rising on his feet.

8-35 A. M.—Restlessness much increased, and occasional convulsive twitches of the tail.

8-38 A. M.—Limbs paralysed, cannot stand.

8-39 A. M.—Tried to rouse himself when called on, but, being unable to stand, fell over on his side.

8-40 A. M.—Convulsions of the limbs and mouth; pupil much dilated.

8-41 A. M.—Micturated and fœces involuntarily passed.

8-43 A. M.—Injected 25 drops of liquor ammonia* into the saphena vein of the right thighs.

8-44 A. M.—Convulsions continue.

8-47 A. M.—Again injected 25 drops of liquor ammonia into the saphena vein.

8-47½A. M.—Dead in 28½ minutes.

The cobra was captured on the 31st August in my fowl-house, where it had regaled itself upon three ducks' eggs after killing a hen that was hatching them.

The blood was examined immediately after death and found to be fluid, but no change could be noticed with the microscope. The white cells presented their normal appearance, and were not found in greater numbers than in healthy blood; the red corpuscles were not altered in shape or colour, but showed little tendency to become piled in rows. About two ounces of dark fluid blood were taken from the right side of the heart about 10 minutes after death and placed in a small unglazed earthenware pot; in seven or eight minutes it coagulated firmly, the clot adhering so tenaciously to the vessel that it did not fall out when inverted. The blood which escaped into the cavity of the thorax also coagulated. The venous system seemed gorged with dark fluid blood, which showed no tendency to coagulate until exposed to the air. Both sides of the heart were distended with dark fluid blood, and the liver and kidneys were also much congested and of a darker tint than usual. Rigor mortis occurred two-and-a-half hours after death. Scarcely any trace of the bite could be seen externally after death.

Temperature at the time of experiment 83° Fah.

2nd experiment at 7-25 A. M. *on the 21st September* 1871.—A large spectacle-marked cobra struck at a full-grown pariah dog and inflicted a wound on its nose. A portion of the outer skin was torn off, and blood was seen to flow immediately after the cobra struck; yet the dog remained quite unaffected beyond appearing somewhat lazy and inclined to be down. Next day it was alive. The cobra struck also at the dog's leg, but did not inflict any wound. The snake had been confined for about three weeks in a *gurrah*, and during that time had not eaten nor drank anything. He did not appear very lively, but when irritated, raised his head, expanded the neck, and struck vigorously.

Luckily the remedy was not applied in the case, otherwise erroneous conclusions might have been drawn.

3rd experiment at 7-59 A. M. *on the 24th September* 1871.—A full-grown, healthy pariah dog was bitten on the side by the same cobra as in No. 1. The bite left scarcely any mark externally, and was discovered with difficulty. For 10 minutes afterwards the dog showed no signs of anything being wrong, not even when walked about.

8-12 A. M.—However, he appeared to be lazy and lay down.

8-16 A. M.—Legs partially paralysed, and unable to control their movements.

8-19 A. M.—Making water involuntarily; injected 20 drops of liquor ammonia B. P. into the saphena vein of the left leg; this produced no apparent effect; the dog remained lying on its side, breathing slowly.

8-21 A. M.—Pupils widely dilated; dog cannot stand.

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* The liquor ammonia was that supplied by the Government to the Charitable Dispensaries, and is the ordinary liquor ammonia of the British Pharmacopœa.

8-24 A. M.—Convulsed; injected into the same vein 20 drops of liquor ammonia B. P.; no apparent effect produced.
8-29 A. M.—Injected 20 drops of same solution into the right saphena vain; no effect produced.
8-31 A. M.—Laid bare the external jugular vein on the right side of the neck and injected 20 drops of same solution; no effect apparently.
8-33 A. M.—Dog apparently lifeless; he lay quite motionless and could not be roused; no movement of the muscles of respiration could be noticed; the pupil was widely dilated, and the eyelids did not respond when the eye was pricked, but the heart was found to be beating feebly and irregularly.
8-38 A. M.—Commenced artificial respiration.
8-42 A. M.—Injected 17 drops of liquor ammonia into the right jugular vein; heart's action slightly increased.
8-45 A. M.—Heart still beating irregularly.
8-48 A. M.—Ditto ditto.
8-53 A. M.—Ditto ditto.
8-57 A. M.—Heart still beating.
9-4 A. M.—Heart beating feebly.
9-5 A. M.—Artificial respiration being still continued, I made an aperture in the left side of the thorax, through which I could see the heart beating slowly and irregularly.
9-6 A. M.—Injected 20 drops of liquor ammonia into the right ventricle. This was followed by vigorous and greatly accelerated action of the heart; the blood being propelled with some force along the arteries.
9-8 A. M.—Put an end to the experiment by opening the femoral artery, from which blood of a dark colour spouted in considerable quantity.

The blood coagulated quickly and firmly on exposure to the air. Temperature of air in the shade 84° Fah. The blood, however, remained fluid for some time, if not exposed to the air. All the blood vessels of the heart having been ligatured, and organ having been detached, the blood it contained was found to be quite fluid at 9-34 A. M.

The lungs were somewhat congested, and did not crepitate on pressure. A quantity of frothy blood oozed from them when cut, the cut surface showing dark points where veins of any size had been cut. The liver was of a very dark colour, and the membranes of the brain were slightly congested, but the other organs of the body did not present any change worthy of notice. Rigor mortis set in 2½ hours after death. No abnormal appearance could be noticed in the blood, which was examined immediately after death and also eight hours afterwards.

4th experiment at 7-10 A. M. *on the* 28*th September* 1871.—At 10 minutes past 7 A. M. a large spectacle-marked cobra bit a fine healthy pariah dog (full-grown) savagely on the tail.

7-14 A. M.—Dog appears unaffected.
7-17 A. M.—Ditto; pupils not dilated.
7-19 A. M.—Ditto ditto.
7-20 A. M.—Emptied the bowels voluntarily.
7-21 A. M.—Has lost the power of controlling the movements of his limbs; staggers like a drunken man when walking, and places his legs wide apart when standing.
7-22 A. M.—Urinated voluntarily.
7-23 A. M.—Breathing slowly; slight frothing at the mouth.
7-26 A. M.—Slight convulsions.
7-26½ A. M.—Injected 20 drops of liquor ammonia B. P. into the external jugular vein.
7-27 A. M.—Convulsions continue; movements of respiration not perceptible.
7-29 A. M.—Injected an additional 20 drops into jugular vein.
7-29½ A. M.—Commenced artificial respiration, which was not discontinued until death.
7-33 A. M.—Slight convulsion; heart beating with considerable force, but somewhat irregularly.
7-35 A. M.—Slight convulsion; heart still beating.
7-40 A. M.—Heart still beating.
7-43 A. M.—Ditto.
7-47 A. M.—Ditto.
7-52 A. M.—Ditto.
7-58 A. M.—Ditto with considerable force.
8-4 A. M.—Injected 20 drops of liquor ammonia; no effect.
8-5 A. M.—Heart stopped; dead.

Blood coagulated as soon as taken out of the body and exposed to the air.

Microscopically it presented its normal characteristics. No change whatever could be noticed either in the contour or numbers of the white cells.

Rigor mortis supervened 2½ hours after death. Temperature of the air 80°.

5th experiment. No treatment.—At 7-33 A. M. a full-grown pariah dog was bitten on the foreleg by a small spectacle-marked cobra.*

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* This was a fresh newly-caught cobra.

7-40 A. M.—Unaffected, except that he walks lame with the bitten leg.

7-46 A. M.—Holding up the wounded limb, in which he seems to suffer a little pain; no signs of the poison acting on the system.

8-1 A. M.—Lies down, and has lost control over the muscles of his limbs; staggers much when made to walk.
8-2 A. M.—Lying down and cannot be persuaded to move.
8-4 A. M.—Changes his position.
8-5 A. M.—Legs appear paralysed; respirations 28 per minute, regular.
8-6 A. M.—Appears to be sensible, and endeavours to get up when called upon.
8-7 A. M.—Appears sensible, and wags his tail when called on; respirations 32 per minute; expirations somewhat prolonged and forced.
8-8 A. M.—Appears sensible; wags his tail when called on.
8-9 A. M.—Micturated involuntarily.
8-10 A. M.—Respirations, laboured, 28 per minute.
8-11 A. M.—Again micturated involuntarily.
8-12 A. M.—Frothing at the mouth; wags his tail when called on; eyelids contract when the eye is touched.
8-13 A. M.—Gurgling noise in the throat at each inspiration; convulsive twitching of the mouth.
8-16 A. M.—Micturates, and passes fœces involuntarily.
8-18 A. M.—Respirations 20 per minute, laboured; pupils widely dilated.
8-19½ A. M.—Pulse 74, regular and of fair strength.
8-20 A. M.—Eyelids do not contract on application of a stimulus.
8-21 A. M.—Respiratory movements almost imperceptible.
8-22 A. M.—Pulse 60°, somewhat irregular and weaker; respiration ceased.
8-24 A. M.—Apparently quite dead; heart's action imperceptible.

8-26 A. M.—An aperture was made in the chest and the heart exposed. Its contractions had ceased, and both the auricles and ventricles were distended with blood. The pulmonary arteries were also distended. The blood in all the cavities had the same dark fluid appearance and coagulated firmly soon after exposure to the air. The lungs were of a light scarlet colour, and on making a section of them, dark venous blood oozed from the divided pulmonary vessels. There was no congestion of the blood vessels of the scalp or duramater, but the arachnoid contained a considerable quantity of effused serum.

Arborescent streaks of venous congestion were noticed following the sulci between the convolutions of the cerebrum. On making a section of the substance of the brain, no abnormal appearance was observable. All the abdominal viscera were healthy looking. On examining the blood immediately after death, no abnormal appearance could be detected. The red corpuscles were of their usual size and numbers, and also the white cells.

Rigor mortes occurred about three hours after death.

Temperature at the time of experiment 79°.

In this case no treatment was adopted, so that the action of the unalloyed poison might be observed, and it will be noticed that the symptoms were identical with those observed in other experiments when ammonia was injected.

6th experiment, October 16*th*, 1871.—At 7-46 A. M. a medium-sized cobra* bit a full-grown pariah dog on the leg (left hind).

7-47 A. M.—Runs lame on the bitten leg, which it holds up.
7-52 A. M.—Injected 20 drops of liquor ammonia into the right external jugular vein, which was exposed for the purpose.
7-53 A. M.—Heart's action accelerated, but otherwise the animal is apparently unaffected; no symptoms of poisoning.
7-56 A. M.—Bowels opened voluntarily.
7-57 A. M.—With the exception of the lameness, dog is apparently quite unaffected.
8-4 A. M.—Injected again into the same vein 20 drops of the liquor ammonia, which produced acceleration of the pulse, but no other visible effect.
8-6 A. M.—Appears quite unaffected.
8-7 A. M.—Frothing a little at the mouth.
8-9½ A. M.—Micturated copiously and voluntarily.
8-10 A. M.—Lay down; staggers when walking.
8-11 A. M.—Heart beating irregularly.
8-12 A. M.—Injected 50 drops of liquor ammonia B. P. into the same vein.
8-13 A. M.—On being released tried to stand, but cannot.
8-14 A. M.—Eyelids close on touching the eye.
8-15 A. M.—Gasping for breath; heart's action very irregular; eyelids still retain their sensibility to impression.
8-16 A. M.—Injected 20 drops liquor ammonia B. P. into the same vein.
8-18 A. M.—Breathing very irregularly and in gasps; convulsive movements of the trunk; extremeties remaining motionless.
8-21 A. M.—Pulse 118.
8-22 A. M.—Respiratory movements quite imperceptible.

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* Fresh newly-caught cobra from Dhanpore.

8-23 A. M.—Heart beating.

8-24 A. M.—Ditto rapidly.

8-25 A. M.—Ditto feebly and irregularly.

8-26 A. M.—Dead. Temperature 77°.

Examined blood corpuscles and found no change.

7th experiment to test the efficacy of secret remedy furnished by a Native.—Native remedy administered. Symptoms supervened in 29 minutes. Dead in 46 minutes.

Healthy, full-grown pariah dog bitten on the right forefoot at 8 A. M. on the 17th by a large cobra,—the same used in experiment No. 1. At 8-2 A. M. a secret medicine, consisting of a yellowish green powder, composed evidently of sulphur and sulphate of iron, with some pounded herb, was mixed with some warm water and administered to the dog by a Native hukeem who has some reputation in Bijnour as a curer of snakebites. After the medicine was given the animal appeared quite unaffected, except that it walked very lame on the bitten leg.

8-6 A. M.—He administered a small bolus, about the size of a bean, containing some medicine mixed with sugar.

8-10 A. M.—Dog apparently quite unaffected; growls when approached; some warm water administered.

8-15 A. M.—Walking very lame on the bitten leg.

8-22 A. M.—No symptoms indicating that the poison was acting on the system.

8-27 A. M.—Micturated voluntarily.

8-29 A. M.—Lay down; appears disinclined to move about.

8-30 A. M.—Passed fœces; walks unsteadily.

8-32 A. M.—Cannot walk, endeavours to rise, but cannot stand; apparently quite sensible and shuts the eyelids when anything is put suddenly in front of the eye.

8-34 A. M.—Respirations 26 per minute.

8-36 A. M.—Appears choked; a rattling noise accompanies each expiration; heart's action irregular; eyelids still sensitive to impressions.

8-43 A. M.—Respiratory movements imperceptible.

8-45 A. M.—Heart beating rapidly, 80 per minute.

8-46 A. M.—Dead in 44 minutes.

Post-mortem examination.—No change in appearance, or numbers of blood corpuscles, or white cells. Heart distended on both sides with dark fluid blood, which coagulates on exposure to air. The peristaltic movements of the intestines were plainly observable ten minutes after death. All the venous system was engorged with blood. Temperature of air 76°. Bitten part somewhat swollen, and a good deal of ecchymosis round the wound. No effect whatever was produced by the medicine.

8th experiment on the 1st November 1871.—Symptoms supervened in 2 hours 25 minutes. Dead in 2 hours 53 minutes.

At 8-40 A. M.—A full-grown donkey was bitten on the side of the belly by a large cobra (the same used on the 17th). A little blood oozed from the wound, which became somewhat swollen and plainful on pressure, but no toxic symptoms set in until 11-5 A. M., when the animal became drowsy and lay down quietly without resting his head on the ground.

11-15 A. M.—The drowsiness increased somewhat and the forelegs trembled; on being urged he made several efforts to rise, but did not succeed; on being placed on his legs he remained standing with the forelegs trembling and the head slightly depressed.

11-20 A. M.—Remains standing; some stringy saliva oozing from the mouth; lower lip hanging down; eyelids sensible to impressions, and, when a piece of chappatee was placed near the mouth, he seized, but did not masticate it; heart beating slowly, but regularly; breathing slow, and expiration forced by the action of abdominal muscles; slight convulsive movement of the muscles of the neck.

11-20½ A. M.—Fell down heavily, all his legs seeming to give way at once; made no attempt to get up, and rested the head on the ground.

11-21 A. M.—Breathing laboriously with expanded nostrils.

11-23 A. M.—Injected* 20 drops of liquor ammonia into the saphena vein, which did not produce any effect whatever.

11-25 A. M.—Breathing very heavily.

11-27 A. M.—Injected 20 drops of liquor ammonia into the left jugular vein, which had been previously laid bare; no effect produced.

11-29 A. M.—Breathing imperceptible; heart still beating, but slowly and feebly.

11-30 A. M.—Apparently dead, but heart still beating.

11-33 A. M.—Heart ceased to beat.

11-33½ A. M.—Made an opening rapidly in the thorax, and exposed the heart, which contracted when scratched with the nail, or pricked with a needle.

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* Used liquor ammonia *fortior*, British Pharmacopiæ, specific gravity ·891. Obtained from Medical Depôt, Allahabad.

11-34 A. M.—Injected 20 drops of liquor ammonia into the right ventricle, which caused one or two feeble contractions.

11-36 A. M.—Injected an additional 20 drops of liquor ammonia into the right ventricle, which was followed by no result. The blood was examined microscopically immediately after death, and one or two of the six or eight samples examined seemed to have rather more than the usual number of white cells; but these were not swollen, nor could there be seen any of the appearances alleged by Professor Halford to occur in the blood after cobra-poisoning,—*vide* Aitkins' *Science and Practice of Medicine*, page 713, vol. I. The condition of the internal organs was the same as that seen in dogs after cobra bite; but in this case, the effusion of serum on the surface of the brain was greater than usual. Blood coagulated on exposure to air; temperature at the time of experiment 81°.

Death did not take place in this case until nearly three hours had elapsed, which is attributable to the snake having been used about fourteen days before, and having eaten nothing in the interval. Besides this, it bit the rope by which the donkey was fastened about three minutes before biting the donkey itself, and, probably in doing so, a portion of the poison was expended. A cobra is capable of killing a much larger animal than a donkey in less than three hours. Mr. LeMaistre, a resident of this station, assures me that on one occasion *he saw* a cobra bite a cow belonging to him, and that the latter died before he could get an iron heated with which he intended to cauterise the wound, so that death most probably ensued within one hour. It is worthy of notice, too, how long the animal in this case remained apparently quite unaffected, and how rapidly it died after the toxic symptoms first showed themselves.

9th experiment on the 4th November 1871.

8-50 A. M.—A young and almost full-grown goat was bitten on the left ear by a small cobra.

9-1 A. M.—Much inclined to lie down, but rises when food is offered to it; heart beating regularly; hind legs trembling.

9-6 A. M.—Injected 20 drops of liquor ammonia into the external jugular vein; no apparent effect.

9-9 A. M.—Lies down.

9-11 A. M.—Refuses to eat.

9-12 A. M.—Can still walk.

9-18 A. M.—Frothing at the mouth; respiration embarrassed.

9-19 A. M.—Injected 20 drops of liquor ammonia* into the same vein; no effect produced.

9-20 A. M.—Unable to stand.

9-22 A. M.—Again injected 20 drops of liquor ammonia; no effect produced.

9-23 A. M.—Convulsive movements of limbs and tail; breathing carried on almost entirely by the diaphragm; eyelids still sensible to impressions; heart beating slowly and irregularly.

9-27 A. M.—Injected 20 drops of liquor ammonia into the same vein.

9-28 A. M.—Heart beating slowly; eyelids still sensible to impression.

9-31 A. M.—Respiratory movements imperceptible.

9-34 A. M.—Heart ceased to beat; dead.

9-34½ A. M.—Opened the thorax rapidly, and, on scratching the heart, it beat feebly once or twice.

9-35 A. M.—Injected 20 drops of liquor ammonia into the left ventricle; no effect produced. The blood was fluid, and coagulated on exposure. Internal *post mortem* appearances similar to those seen in dogs and donkey. No changes could be noticed in the appearance of the white cells of the blood. In the goat the red corpuscles are very small, being about one-half the size of man's, while the white corpuscles are of nearly the same dimensions as in other vertebrate animals, and are very conspicuous in the field of the microscope. I examined them minutely, but could not detect any abnormal appearance.

10th experiment, November 8th, 1871.—At 8-46 A. M. a full-grown dog was bitten on the inside of the thigh by the same cobra which bit the donkey on the 1st November. The snake bit with much reluctance and riot, until he had been irritated for about ten minutes.

Until 9-30 the dog appeared quite unaffected, with the exception that he seemed inclined to lie down. The respirations at the time were 22 per minute. The bitten part did not swell much, and the dog did not show any signs of pain. I then left him.

10-22 A. M.—I returned, having been informed that the toxic symptoms had set in.

10-24 A. M.—The pulse was 96 and regular, and the animal was lying quietly on his side; he could stand when raised, but could not walk.

10-26 A. M.—The respirations were 28 per minute, and the movements of the chest appeared unembarrassed.

10-28 A. M.—Injected 20 drops of liquor ammonia *fortior*, British Pharmacopiæ, specific gravity ·891, into the jugular vein after laying it bare. This produced no effect, or at most a temporary acceleration of the heart's action, which did not last longer than a minute.

10-30 A. M.—Pulse 82, regular and full.

10-32 A. M.—Respirations 36 per minute, unembarrassed.

10-33 A. M.—Cannot stand when put upon his legs.

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* Liquor ammonia *fortior* of the British Pharmacopiæ, specific gravity 0·891.

10-36 A. M.—Injected 20 drops of liquor ammonia into the jugular vein; no effect produced beyond some acceleration of the heart's action.

10-37 A. M.—Opened the jugular vein, and abstracted about six ounces of blood.

10-40 A. M.—Injected 20 drops of liquor ammonia into the vein of the opposite side, after which the heart's action increased in force and frequency, and the dog struggled a good deal.

10-41 A. M.—The breathing becoming embarrassed, artificial respiration was resorted to.

10-45 A. M.—Moves the ear by reflex action when a stimulus is applied to it.

10-48 A. M.—Pulse 64, irregular.

10-49 A. M.—Respirations 22 per minute, and expirations forced, tongue hanging out of the mouth, from which saline is flowing.

10-52 A. M.—Poured 15 drops of liquor ammonia, diluted with an ounce of water, into the throat; but it is questionable if any found its way into the stomach, as the animal was unable to swallow.

10-55 A. M.—Breathing imperceptible; laid bare the wall of the chest over the heart, and injected 20 drops of liquor ammonia into that organ. As soon as the point of the syringe touched the heart, vigorous contractions followed. The ammonia also excited strong contractions. The animal is apparently dead, but the heart still continues to beat.

10-59 A. M.—Dead; heart stopped acting.

11 A. M.—Injected 20 drops into the heart; no result. On opening the chest the venous system was, as usual, found gorged with dark fluid blood, but both sides of the heart contained large, firm, darkly-coloured clots, when examined five minutes after death. Ammonia has the property of retarding the coagulation of blood, so in this case probably the presence of the tube of the syringe in the cavities of the heart may have caused the coagulation. It is possible, too, that a very small quantity of air may have been injected with the ammonia. On examining the blood microscopically, no abnormal appearances could be detected.

In this case the snake bit feebly and reluctantly. It had not eaten anything for a month, and had bitten thrice or four times in that period, so it is possible there was a deficiency of poison in the fangs. The toxic symptoms did not come so rapidly, or with such severity as in the other experiments, yet the injection of ammonia seemed to produce no effect beyond exciting the heart's action for about a minute.

Six ounces of blood were taken from the jugular vein to relieve the heart from distension at 10-37, and, at 10-40, 20 drops of ammonia were injected without any good result, even when accompanied with artificial respiration. When the remedy was injected into the heart itself, it did not seem to have any better power of averting the fatal termination, and when the heart's action had stopped, ammonia failed to renew it, although injected within a minute after cessation of cardiac movements.

11th experiment, November 18th, 1871.—At 8-40 A. M. a full-grown pariah dog was bitten very savagely on the hind leg by a small spectacle-marked cobra.

8-43 A. M.—Five pills of a snakebite remedy, furnished by Mr. A. M. Cameron, of Agra, and alleged by him to have cured "upwards of 1,600 persons bit by every variety of snakes," were administered in a small quantity of ghee.

8-57 A. M.—The dog began to stagger and show other signs of the poison affecting the system.

8-58 A. M.—Five more pills were given in a little ghee; the dog swallowing them with some difficulty.

8-59 A. M.—Cannot stand.

9 A. M.—Breathing with difficulty, and occasional convulsive movements of the limbs.

9-6 A. M.—Respiratory movements of the chest imperceptible.

9-10 A. M.—Heart ceased to beat; dead.

The medicine was administered according to directions furnished by Mr. Cameron. The stomach of the dog was examined after death, and the pills were found broken up and mixed with the contents of the viscus. One pill only was found in the esophagus. The medicine had apparently no effect whatever.

12th experiment, November 22nd, 1871.—At 8-5 A. M. a strong, old pariah dog was bitten on the hind foot by the same cobra used in the last experiment.

8-20 A. M.—Made a deep incision on the cardiac side of the bite, and applied strong nitric acid freely to both the incision and bite after scarifying the latter.

8-25 A. M.—Administered 15 drops of liquor ammonia by the mouth, after which the dog was chased about an enclosure, and kept constantly on the move.

8-30 A. M.—Appears somewhat lazy and disinclined to move, otherwise quite unaffected. He did not appear to suffer much pain in the bite, and never held up the leg when walking; but the temperature of the bitten limb was much higher to the touch than the other.

8-32 A. M.—Administered 15 drops of liquor ammonia again by the mouth; no perceptible effect.

8-48 A. M.—Administered 15 drops again; no effect; dog kept continually on the move.

8-52 A. M.—Appears very lazy and inclined to lie down.

8-55 A. M.—Cannot control the movements of his limbs, and staggers when walking.

8-56 A. M.—Administered again 15 drops of the ammonia; no effect.
8-58 A. M.—Cannot stand, appears quite conscious, and tries to rise when urged, but cannot; pupils somewhat dilated.
9-5 A. M.—Cut down on the carotid artery and exposed it. The blood which flowed from the wound was crimson, and coagulated in two or three minutes after exposure to the air, and it was noticed that the blood never assumed a dark tinge until the respiration became impeded. Some of the blood taken fresh from the body was now examined with the microscope, but no abnormal appearance could be observed.
9-25 A. M.—Injected 20 drops of ammonia directly into the heart, which was followed by acceleration of the pulse for a short time (about a minute): the dog also struggled a good deal for the same period.
9-27 A. M.—Respirations 16 per minute.
9-29 A. M.—Pulse 120, regular, and of moderate strength.
9-32 A. M.—Winks the eye when touched.
9-46 A. M.—Pulse 98.
9-47 A. M.—Respirations 12 per minute.
9-53 A. M.—Breathing stertorous.
9-55 A. M.—Respirations 9 per minute, laboured.
9-56 A. M.—Pulse 98, intermitting.
10-3 A. M.—Respirations 9 per minute.
10-4 A. M.—Pulse 94, intermitting.
10-9 A. M.—Gasping for breath and struggling.
10-10 A. M.—Pulse 88.
10-12 A. M.—Movements of respiration not perceptible.
10-15 A. M.—As the dog was almost dead, an end was put to the experiment by severing the carotid artery, from which blood of a dark colour spouted with force.
10-16 A. M.—The chest was opened, and the heart found beating, and it continued to beat for a minute, the right auricle contracting after all movement had ceased in other parts of the heart.

The snake bit very effectively, keeping its fangs fixed in the skin for some seconds; but it had been used in an experiment four days previously, and probably it did not possess a large supply of poison. To this it was due without doubt that the dog lived longer than usual, because neither the application of nitric acid nor the administration of ammonia seemed to produce any beneficial effect. On opening the heart the left ventricle was found empty, while the right side contained some frothy blood. The lungs and all the organs of the body presented an ex-sanguine appearance owing to the loss of blood; but the chief points to be noticed in the experiment are, that the blood did not assume a dark colour until the breathing became impeded, and that the heart preserved the power of contracting to the very last, even although deprived of the stimulus, which the presence of a proper quantity of blood in its cavities affords.

The ammonia in this case was administered by the mouth.

No. 92, dated 10th November 1871.

From—W. Moir, Esq., M. B., A. M., Civil Surgeon, Meerut,
To—The Offg. Secy. to Govt., N.-W. Provinces.

I have the honor to acknowledge receipt of Mr. Mackintosh's letter No. 884, dated 28th August 1871, forwarding a pamphlet by Professor Halford on the treatment of snake-bite for the expression of my opinion on the subject.

2. Before offering any remarks on it, I was desirous of trying one or two experiments illustrating the effects of the treatment recommended by him in snake-bite, and it was only a few days ago that I succeeded in obtaining a poisonous snake, and was enabled to test the efficacy of his mode of treatment; hence the delay in submitting this letter.

3. Professor Halford records in the pamphlet 20 cases of snake-bite, out of which 17 were successfully treated by the injection of liquor ammonia into the vein, and three proved fatal.

4. I observe that his 1st, 16th, 18th, and 19th cases are the only ones where the interval between the bite and the application of the remedy is given; it was four hours in the 1st and 16th, between seven and eight hours in the 18th case, and about twelve hours in the 19th, which proved fatal; and as it was only a "supposed" case of snake-poison, it ought not to have appeared in this list at all. The 20th case also proved fatal, which is accounted for by the fact that brandy had been freely employed in the first stages of the treatment, and the ammonia only in the last. The 8th case, he says, is doubtful, and the 10th showed symptoms of drunkenness rather than of snake-poisoning.

5. With the exception of these first five cases, no information whatever is given regarding the interval that elapsed between the infliction of the bite and the application of remedial measures; nor is it stated in any one instance what part of the body was bitten, nor is any instance noted of the marks of teeth having been observed by the operators, nor of the escape of blood from the wounds.

6. Neither is any account given of the behaviour of the patients until they are described as being "comatose," "sinking," "insensible," "cold," "totally paralysed," &c., &c. No idea is imparted as to the time when these symptoms manifested themselves, nor what were the progressive symptoms, nor the physical signs of the action of the poison.

7. In only three of the 20 cases is the species of snake noted, and only one of the 20 patients was seen by Professor Halford himself.

8. The omission of these points is so important that it is impossible to form a correct judgment of the true nature of the cases, and it deprives the record of much of its value and interest, both physiologically and pathologically. Had these omissions been supplied, one could have formed some notion of the severity of the bite, and of the influence of the medicine employed in the treatment, but the grounds for enabling one to arrive at certain conclusions on these points are entirely wanting.

9. Were it possible to make strict investigation into all the circumstances connected with these alleged recoveries from snake-poisoning by the injecting of liquor ammonia into the venous blood, one would not be surprised to find that in more instances than one the patients had never actually been bitten by a snake at all, and that in others, though bitten, the snake had been of a harmless species.

10. Such cases occur in the practice of almost every medical man. While at dinner one evening a few years ago I was suddenly called away by the cries of a punkah-coolie in my verandah, who had, he stated, just been bitten by a cobra on the dorsum of the foot. He had been lying asleep, and felt a prick which awoke him, and, looking up, he saw a snake running away. At once his cries became so loud and piteous that in two minutes he had all the servants standing in a circle round him, lamenting his fate, which they believed was death. I found him looking most anxious and depressed; his breathing laboured and abdominal.

I carefully examined the foot and all the exposed parts of his body, but could see not a trace of the bite, nor abrasion of the skin anywhere.

I assured him the snake had done him no harm, and showed him he had not been bitten; but to make his assurance doubly sure, I had some liquor ammonia applied to the part, and by degrees his mental anxiety and depression subsided. Next morning he was at his work as usual.

Here imagination produced some of the symptoms and physical signs of the introduction of serpentine virus into the human system; and, had the coolie's statement been relied on, and liquor ammonia been injected, a cure might have been reported from its use.

11. From the data furnished by Professor Halford, it is impossible to decide whether any, or, if any, how many, of his recoveries are due to imaginary bites, or to bites from harmless species, or to partial bites from really venomous snakes; but that the effects of the ammonia treatment are attributable to one or other of these causes, I am unable to see any reason for doubt.

12. Careful experiments made in India have, in the hands of Dr. J. Fayrer, C. S. I., been attended with very different results. The liquor ammonia when injected into the veins seemed to him to do rather harm than good, so far was it from effecting a cure.

This was not Dr. Fayrer's opinion alone; the different medical men who were present and assisted him in his experiments arrived at the same conclusions as to the complete inability of liquor ammonia, when injected into the venous blood, to counteract in any degree the effects produced by the poison of venomous snakes on the bodies of living animals.

13. Professor Halford would have done much to establish the soundness of his practice had he experimented on the lower animals with the poison of snakes as others have done, and restored them to health when evidently under the influence of the virus which others have failed to do by following his mode of treatment. He contents himself by saying at page 18 of this pamphlet "a great series of experiments on apparently dying people had been done all over the colony at his suggestion and with remarkable success." This is unsatisfactory and inconclusive, as *apparently dying* is a delusive expression.

14. That I might test for myself in some measure the conclusions obtained by others, I performed two experiments with cobra poison, and would here note the details. I was assisted by Sub-Assistant Surgeon Troyluckonath Ghose and Hospital Assistant Roheemoollah in making these experiments.

15. *First experiment on a dog of ordinary size.*—Snake, a well-grown cobra, fresh, and full of vigour, bit most freely the inside of both thighs of a dog at 1-32 P. M.

1-35 P. M.—Dog convulsed; eyes staring.
1-36 P. M.—Pupils dilating.
1-37 P. M.—Biting at the rope by which he was bound.
1-39 P. M.—Lies depressed from the effects of the poison.
1-43 P. M.—Defecating and micturating quite unconsciously.
1-44 P. M.—Dead, just 12 minutes after he was bitten.

Second experiment on a young, lively dog about a year old.—Bit at 2-31 P. M. on the thorax by the same cobra.

2-32 P. M.—Struggling as if in pain; fifteen minims of liquor ammonia, British Pharmacopiæ, were injected into the left femoral vein.
2-36 P. M.—Greatly excited; breathing hurried and panting; walking about with unsteady gait.
2-39 P. M.—Lies down.

2-45 P. M.—Rises up; gait very unsteady.
2-46 P. M.—Staggers greatly.
2-47 P. M.—Lies down, over-powered; breathing forced and almost entirely abdominal.
2-48 P. M.—Is conscious when spoken to, but cannot rise.
2-50 P. M.—Breathing stertorous; convulsed; fifteen minims of liquor ammonia were again injected into the right femoral vein; no effect produced.
2-52 P. M.—Micturating unconsciously.
2-55 P. M.—Limbs moving; pupils much dilated; dying.
3 P. M.—Dead in 29 minutes.—(*Dated Meerut, the 3rd November* 1871.)

16. The first dog was furiously bitten, and was so speedily and so completely under the influence of the venom that he never raised his head nor attempted to stand up, but began to sink instantaneously. My object in this case was chiefly to prove the virulence of the poison.

The second dog was less freely bitten and only in one place; not more than an hour had elapsed since the cobra had expended a large quantity of his poison, yet death resulted in 29 minutes. In the course of a minute after the bite 15 minims of liquor ammonia, British Pharmacopiæ strength, were injected into the femoral vein, which I had exposed before the cobra was brought out; it produced much excitement for about five minutes, followed by depression, and when stertorous breathing began, the injection was repeated without any visible effect.

It was at this stage of paralysis that Professor Halford's cases usually began to be treated, and the results were very different from mine; his apparently dying men immediately getting up and walking about, while the dog continued unconscious to the last.

17. The results I obtained accorded so well with those recorded by Dr. Fayrer in his numerous experiments that I deemed it unnecessary to multiply mine. I think it is proved that the injection of liquor ammonia into the veins of an animal thoroughly under the influence of snake-poison is quite useless, if not hurtful. Even were it a complete antidote, practically the boon would have little value. So deadly is the cobra-poison that any remedy to save life would have to be applied the moment the unfortunate creature was bitten; but, while I think it proved that in severe cases this mode of treatment is quite useless, yet in slight cases, where only a very small quantity of the poison has been inserted, the injection of liquor ammonia into the veins may have some specific value as a remedy, but it would require a considerable number of experiments to determine this point. Had I succeeded sooner in finding poisonous snakes, I should have carried out more experiments to solve this and some other doubts.

18. At page 12 Professor Halford refers to objections raised to his plan of treatment on the supposition that Australian snakes are less venomous than Indian, and he quotes two cases of snake charmers, which proved fatal in less than an hour, and a third in less than half an hour; and on the next page he says: "In one instance one of my tiger-snakes killed a dog in seven minutes;" further adding: "I feel certain from my own actual experiments that equal amounts of poison from either American, Indian, or Australian snakes, are equally pernicious." But in this pamphlet he does not record a single one of his experiments on animals, nor of the effects of his ammonia treatment on an animal bitten in his presence by a venomous snake. This is a great desideratum. Had he supplied it, people at a distance could easily have formed a judgment as to the amount of virulence in the poison of Australian snakes. As it is, this cannot be done with certainty by any reader of this pamphlet; but if the bites prove fatal to human beings in half an hour, or even in one hour, as stated, and to a dog, in seven minutes, little doubt is left as to the power of the poison, and it would be most interesting to know if Professor Halford succeeded in saving the life of men or animals similarly bitten, as it would be entirely contrary to experience in India.

19. I do not suppose it is the wish of Government that I should offer any remarks on the hypothetical views entertained by Professor Halford, as to the changes produced in the blood by the introduction into it of the venom of snakes. They do not seem to me of much importance, and I have not a sufficiently powerful microscope at my disposal to enable me either to support or oppose them.

20. From the perusal of this pamphlet I see that the Professor complains of unfair criticism in the *Lancet*: what is there written is unknown to me. I do not take in the *Lancet*, nor have I seen its remarks on this subject, and none of my home journals refer to him.

21. The observations which I have ventured to make are such as have suggested themselves to me on a careful perusal of the Professor's pamphlet, and are, I trust, justly and candidly expressed.

No. 5344, dated 22nd November 1871.

From—H. B. HARINGTON, Esq., M. A., Offg. Secy. to the Chief Commissioner of Oudh,
To—The Secretary to the Government of India, HOME DEPT.

With reference to your letter No. 3155, dated the 27th June last, I am directed to forward the accompanying abstract of correspondence on the subject of Professor Halford's pamphlet on the treatment of snake-bites, and to say that the Officiating Chief Commissioner trusts that, by the judicious measures suggested by Dr. Archer, Deputy Inspector General of Hospitals, Indian Medical Service, the experiment may be fairly tested in this snake-infested province.

2. A copy of Dr. Archer's instructions to the Medical Officers in Oudh is also submitted.

Circular No. 40, dated 15th November 1871.

The Chief Commissioner having sanctioned the experimental employment in Oudh of Professor Halford's method of treating snake-bites, the Deputy Inspector General requests that Civil Medical Officers in the province will indent on the Medical Store-keeper, Allahabad, through this office, for hypodermic syringes to be used according to the instructions contained in page 10 of Professor Halford's pamphlet, a copy of which has been sent to each civil station.

These instructions are not intended to supersede the ordinary remedies applied in recent cases, such as excision, &c., but to be used when the patient is exhausted, or in the comatise state.

C. ARCHER, M. D.,
Depy. Inspr. Genl. of Hospitals,
Indian Medical Service, Lucknow Circle.

No. 1889-97, dated 20th May 1872.

From—J. MUIR, Esq., Offg. Asst. Secy. to the Chief Commr., Central Provinces,
To—The Secretary to the Government of India, HOME DEPARTMENT.

I am directed to reply to your letter No. 3156 of 27th June 1871, forwarding copies of a pamphlet by Professor Halford, of the Melbourne University, on the treatment of snake-bite, for distribution among the Medical Officers in these provinces, and requesting that any valuable opinions received from them might be forwarded to Government.

2. The treatment for the bite of the more poisonous snakes by injection of ammonia has never been tried by any of the Medical Officers in these provinces. In the cases of persons bitten by the less venomous kinds, such as the Chittee and Dhummy or Bungari snakes, Assistant Surgeon Harrison of Sambalpur has found *Eau de Luce* and *Liquor Ammonia* to have a decided effect when applied to the wound by incisions, and at the same time given internally.

3. Dr. Brake, Inspector General of Dispensaries, states that, when danger is immediate and urgent, he would not hesitate to advise recourse to Professor Halford's treatment in preference to all others with which he is acquainted. He thinks lives might be saved thereby, and that no harm could be done by the treatment.

4. Dr. Townsend, the Sanitary Commissioner, states as follows:—

> The efficacy of this treatment is not, I believe, generally allowed, even in Australia, and Dr. Fayrer, in the course of a long series of experiments on snake-poisons, has not found it effectual when tried on lower animals. The probable explanation of the difference in the action of the remedy here and in Australia is that the venom of the Australian snakes is not so deadly as that of the Indian varieties.
>
> Dr. Fayrer has, I believe, had no opportunity of testing Professor Halford's treatment on a human subject, and it might be advisable to do so, should a favorable opportunity occur; but as the operation of injecting fluid into the veins is attended with considerable danger, it should not be attempted excepting by properly qualified persons.
>
> There is not, I believe, any officer in these provinces who has given special attention to the subject of snake-poisons.

5. And Dr. Rice, Civil Surgeon of Jabalpur, reports as follows:—

> In the face of Dr. Fayrer's experiments on the lower animals, in view of elucidating this very point, I do not think I would be justified in treating a man, so circumstanced, with the injection of ammonia *only*, and unless it is the *only* treatment pursued, the results will be of very impaired value; combined with any other, the most I should be able to say is, that it did not succeed in saving life; if the patient happened to recover, I could not say he recovered because of the use of ammonia when another line of treatment was at the same time pursued.
>
> There is no other conclusion open to me, without throwing doubt on Dr. Halford's statements, than that the snakes of the southern continent are not nearly so venomous, nor their poisonous secretion nearly so active in its fatal effects as those of the snakes of this country.
>
> I believe it is received amongst naturalists as a general aphorism, that the nearer we approach the tropics the more venomous is the poison of snakes; perhaps this will account for the difference between the results of the experiments before referred to.

6. There is nothing further that the Officiating Chief Commissioner considers worthy of notice in the reports received.

No. 1361-237, dated 7th August 1872.

From—C. B. COOKE, Esq., Offg. Asst. Secy. to the Chief Commissioner, British Burma,
To—The Officiating Secretary to the Government of India, HOME DEPARTMENT.

I am directed to acknowledge the receipt of your letter No. 3157, dated 27th June 1871, forwarding copies of a pamphlet by Professor Halford on the treatment of snake-bite, and requesting that any valuable opinions received on the subject may be submitted for the information of the Government of India.

2. In reply, I am to say that the pamphlets in question were circulated through Commissioners of Divisions to Civil Surgeons and District Officers, and all the reports which have been received up to the present time are to the effect that they have not yet had any opportunity of testing the efficacy of the treatment proposed by Dr. Halford.

No. 1342-7G, dated the 17th June 1872.

From—J. PUCKLE, Esq., Offg. Secy. to the Chief Commr. of Mysore and Coorg,
To—The Secretary to the Government of India, HOME DEPARTMENT.

With reference to your letter No. 3158, dated the 27th June 1871, forwarding copies of a pamphlet on the treatment of snake-bites, and to your subsequent reminder of the 11th April 1872, I am directed by the Chief Commissioner to forward, for the information of His Excellency the Viceroy and Governor General in Council, the accompanying copy of a letter* from the Deputy Inspector General, Indian Medical Department, reporting the result of the enquiries instituted by him on the subject, from which it will be seen that none of the Medical Officers in Mysore and Coorg seem to have had any practical experience in the treatment of snake-bite by the method advocated by Dr. Halford.

* No. 183 of the 2nd May 1872.

2. The Revd. Mr. Desaint, a Roman Catholic Clergyman at Sethulli in the Hassan District, but now on leave in Europe, forwarded the results of his experiments with ammonia and other remedies in the case of snake-bites, to the Chief Commissioner on the 17th January 1868. He claims to have been successful in several instances, and his paper was published as a supplement in the *Mysore Gazette*, a copy of which I am instructed to forward, with an expression of Colonel Meade's regret that he is unable to obtain any more satisfactory opinions on the subject.

No. 183, dated 2nd May 1872.

From—J. L. RANKING, Esq., Depy. Inspr Genl., Indian Medical Dept., Mysore Divn. and Ceded Dists.
To—The Secretary to the Chief Commissioner of Mysore.

No. [illegible], dated 20th July 1871.
No. [illegible], dated 20th April 1872.

I have the honor, with reference to your numbers as per margin, to report that none of the Medical Officers of the Mysore Commission have any practical experience in the treatment of snake-bite by the method advocated by Dr. Halford.

2. I may state that Dr. Fayrer of the Bengal, and Dr. Shortt of the Madras, Medical Services, instituted a series of most careful experiments as to the efficacy of liquor ammonia when injected in a vein in bites from venomous Indian snakes.

3. I do not think it necessary to lay before the Chief Commissioner the evidence adduced by those officers in support of the inefficacy of the treatment as applies to the bites of Indian snakes, as those officers have doubtless contributed to the enquiry set on foot by the Government of India. But I may add that the evidence is generally accepted by the profession as conclusive of the inefficacy of the treatment.

Dated the 17th January 1868.

From—The REV. C. DESAINT, Missionary Apostolic, Mysore,
To—L. B. BOWRING, ESQ., C. S. I., Commissioner of Mysore.

For more than ten years I have been engaged in treating snake-bites, and in the different countries which I have traversed, I have made particular researches into the remedies employed by the natives, and I have often paid dearly for a knowledge of certain plants, or pretended secrets, said to be infallible; but I was far from being satisfied with anything I discovered. Many persons boasted greatly of particular infallible pills, as they called them, and cited various cases of cure, but they could not tell me when and how I could procure these pills.

Every year I have many cases of snake-bites, and in a single year have known twelve cases, though this year I have had only four. I have employed almost all the remedies recommended by Europeans and natives.

I am no medical man, my intention being simply to explain to you as clearly as possible the result of my researches, and the treatment which has hitherto appeared to me to answer best against snake-bites. But first let me explain as briefly as possible the various remedies upheld and employed by European and native doctors.

When a person has been bitten, in order to prevent the absorption of the venom, all are unanimous in recommending a strong ligature above the bite. This is a good but an insufficient means, for the poison can only be arrested for a while, and if it is not promptly annihilated, it will not be slow in making its ravages.

In order to destroy the venom in the wound, cauterization, either by a red hot iron, or nitrate of silver, or antimony, is proposed; but these violent remedies only affect the poison in the wound, and are useless against that which is already absorbed into the circulation.

To eliminate the latter, stimulants are generally given, and in certain cases real benefit has been derived from the use of Ammoniac, Madeira wine, Sherry, &c. I believe such remedies to be good when the quantity of poison is inconsiderable, but I am persuaded that ammoniac, even if administered in powerful and repeated doses, is insufficient in cases where a great quantity of poison has been injected. Never having had occasion to employ Madeira, I cannot say any thing about it, but nevertheless I cannot imagine it to be a better specific than ammoniac.

Among the plants which natives use, the greater part have no effect, but some appear to me deserving of attention, and of being used. Those which seem to me to have real efficacy against snake-bites are ordinarily the *aristoloches* and *asclepiades.* Among the *aristoloches* of India the *aristolochia bracteata,* known in Canarese by the name *aḍúmuṭṭaḍa gida* seems to hold the first rank. A European planter near Munjerabad assures me that he himself saw this year a person of his plantation, bitten and insensible, thoroughly cured by the juice of this plant, which they made him take interiorly.

Near Bangalore and in Coimbatore they esteem greatly the root of the *osclepias volubilis* known in Tamil by the name of *palai.* It is considered sufficient to make the person who has been bitten eat the root. Many cases of cure by the use of this medicine have been mentioned to me, but it is also admitted that it does not *always* succeed.

Others use the *asclepias acidasindi kodi* in Tamil). They give the root, powdered, in doses of 15 to 20 grains, and repeat the dose three times every 10 or 20 minutes.

The root of the *ophioxylon serpentinum,* found in the bazaars under the name of *sútiranábi,* is much used against snake-bites, the powder of it being applied to the wound, and a decoction of it to the interior.

The Konkanees have great confidence in the root of a plant which they call *nari visha,* of which they grind on a stone the root with a little liquor, and apply it to the wound and also administer it internally; and if the patient becomes insensible, a pot containing fire is placed on his head.

I do not possess facts to enable me to pronounce an opinion on the efficacy of these plants, and therefore content myself with mentioning them.

They esteem also a porous stone called "serpent stone," which is reputed to absorb all the poison on being applied to the wound. I am acquainted with the composition of this stone, but I do not think it worth mentioning.

As regards the remedies employed by jugglers and snake-charmers, I have always assumed that they were frauds skilfully played to deceive the credulous, and to sell dearly unimportant remedies.

Orfila, in his *General Toxicology,* vol. II, p. 536, appears to place arsenic at the head of the list of specifics against snake-bites, and says that the arsenic of potassium and arsenic acid have been employed with the greatest success against the bites of venomous snakes, citing in support of this fact many observations, which may be read in volume 2 of the *Medical Chirurgical Transactions of London.*

Russell, in his famous work on Indian serpents (*An Account of Indian Serpents collected on the Coast of Coromandel,* by Patrick Russell: London, 1796, 2 vols.) reports the experiments that he made with arsenic acid, and refers to the pills of Tanjore as an Indian preparation much in vogue for healing the bites of venomous animals. He does not mention their composition, but he says that the white oxide of arsenic (arsenic acid) is the basis of it, and that a pill of six grains contains rather less than three-fourths of a grain of it.

Are not these pills the same as those which have been recommended to me so highly, and of which so many cases of cures have been reported, which I have so long sought for, and of which I am now about to give you the composition? I am disposed to think so. However the following is the composition of these celebrated pills:—

Tamil Names.	*Latin Names.*	*English Names.*
Nari visham	(Erythronium Indicum?)	
Sútira nábi	Ophioxylon serpentinum	Opioxylon of serpents.
Aridalum	Arsenicum flavum	Yellow orpiment.*
Manosile	Arsenicum rubrum	Arsenic realgar.
Kipashana	Arsenicum album	White oxide of arsenic.
Panjam palai	Aristolochia bracteata	Floral leaved birthwort.
Marukarankai	Gardenia dumetorum	Emetic nut.

An equal portion (in weight) is taken of each of these ingredients, which are mixed and pounded for three hours in betel juice (betel leaves), a little *ganjī* is then added, and pills are made of the size of a grain of *dolichos catiang.* One or two of these pills are broken over the wound, and one or two are taken in the juice of betel leaves. At least three may be given for the interior.

I could mention numerous cases of cure worked by these pills. Our Venerable Pro Vicar, M. Jarrige, who has passed more than 40 years in India, and who has often tried them, can testify to this. As for myself, permit me to mention the last serious case which I have had to treat.

At the end of July, a woman of Mandra, a village near Suthulli, was returning home towards evening, bearing a bundle of herbs on her head. In passing along the little road which leads to the village, and which is bordered by an aloe hedge, she put her foot on an enormous cobra which twined itself round her leg and bit her deeply. The frightened woman was obliged to seize and pull away the snake by her hand to get free from it. She was brought to me about three quarters of an hour after the accident. A ligature had been attached above the wound. The leg was much swollen, but the woman did not suffer violent pain, though there was sensible numbness and weakness in all the body. She seemed stupefied and dull, her responses being slow, but as I did not know her, I supposed this to be her ordinary character. I made her take 20 drops of ammoniac in about an ounce of water, and cauterized the wound with ammoniac, as I shall mention hereafter.

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* Native sulphurs of arsenic to be used.

Perceiving nothing extraordinary, I left the woman in my verandah and went to supper. Scarcely had I sat down, when I was told that the woman had experienced shiverings and tremblings. She then lost all consciousness, though I was not told of this. I finished my repast and returned to visit her. I found her insensible, the head bent on the stomach, the teeth firmly closed and the extremities of the limbs cold. I then thought that all was over, and took out my watch to see exactly in what time she would expire. Being desirous, however, not to have any ground to reproach myself with, I got her jaw opened by two men, and made her swallow a pill with a little betel juice. Ten minutes afterwards, not observing any change for the better, I broke a second pill in betel juice, and tried to make her swallow it. But the pill thus broken seemed to stick in her mouth, so that I took at once a third pill, which I got slipped down her throat with a little juice of betel leaves. In about two minutes the woman sighed, and after a few moments she seemed to open her eyes. I then ordered two men to raise her up and to make her walk. She was thus forced to move about ten paces. She then opened her eyes widely and looked round her with a vacant air. I told the men to let her move cautiously. She supported herself with difficulty, and at my request returned to me slowly and staggering. She then asked what had happened to her, and seemed to recover her senses perfectly. During the night she vomitted twice, and the next morning returned home perfectly well.

I cannot guarantee that these pills will always succeed infallibly, but I think I can state with assurance that they are the best and most certain remedy hitherto known; for we perceive in their ingredients three kinds of arsenic, a substance recognized by the most learned medical men, who have written regarding the venom of snakes, to be most efficacious, as well as those plants which are most stimulant and most recommended against snake-bites.

But to ensure the efficacy of these pills, we must, at starting, be certain of the purity of the ingredients and be very careful about their manipulation. The ingredients must be mixed and boiled together for at least three hours, and the pills must be administered in the juice of betel-nut, and never in water, it being asserted that water destroys their properties.

Moreover I believe that one could not draw any conclusion from experiments made with these pills on fowls or dogs which had been bitten, and which nevertheless died; for it is evident that, *cæteris paribus*, a much greater quantity of poison is required to kill a man than a fowl. A remedy, therefore, which may give a man sufficient strength to overcome the poison, may fail completely with weaker animals. Again, it appears that three pills are ordinarily required to destroy the poison of a snake, whereas this quantity administered to a fowl would kill it.

Permit me now to inform you of the course I take in treating snake-bites.

All serpents may be divided into two great classes :—*1st*, those whose bite causes death speedily, and *2nd*, those whose bite is followed by gangrene, and only causes death some months after the accident, generally, that is, in four or six months. Among snakes of the first class, the *cobra di capella* and the *viper elegans* or painted snake, known in Canarese by the name of *bale katuka*, are the most formidable. Their bite rarely causes much pain, but is followed by numbness of the bitten part, weakness and faintness, while the jaws contract and are set, the tongue becomes thick, the mouth becomes covered with foam, and death often ensues in two or three hours.

The snakes of the second class are generally called in Canarese *mandalada hàvu*, in consequence of the zones or circles on their backs. Their bite causes extreme and burning pain and shiverings and tremblings of the entire body, while the bitten part swells. These appearances diminish in 24 hours, the swelling disappears, but the gangrene commences and makes frightful ravages. The bitten person sees his flesh become putrid, until the gangrene gaining the vital parts causes death.

TREATMENT OF SNAKE-BITES.

The treatment of snake-bites is both interior and exterior.

1. As soon as a person is bitten, a ligature lightly tied should be fastened above the wound. It should not be of cord nor of very small fastenings which might irritate the skin. It should also not be continued too long, lest it increase the livid tint and favor the development of gangrene. Indians generally make their ligature a great deal too tight, but if the swelling is considerable, and the pains severe, &c., I dispense with the ligature.

2. I lose no time in at once treating the wound. I take a little glass tube, made to cut at the end and filled with ammoniac, and force it down as deep as possible into the wound. I remove the edges, and scrape gently the interior of the wound, pressing lightly and letting it bleed as much as possible. During this operation, the ammoniac contained in the tube descends by degrees, and penetrates to the bottom of the wound. I scrape the blood which flows with ammoniac, and I have often seen, during this operation, the poison contained in the wound adhere to the extremity of the tube in an oily and viscous form. I wipe the tube impregnated with blood, steep it again in ammoniac, and recommence the operation two or three times. Having thus cleansed and thoroughly cauterized the wound with ammoniac, I take a small dressing of pure ammoniac and apply it to the wound. The ammoniac acts as a blister, and bubbles rise up here and there, which greatly aid, I believe, in destroying the effects of the

poison. Formerly I used to cauterize with butter of antimony, but I have found out that ammoniac thus applied is far preferable.

3. As for interior treatment, as soon as a patient is brought to me, I make him take 20 drops of ammoniac in about an ounce of water, and attend to the wound as I have described. The wound having been cauterized and dressed, if the effects of the poison diminish, I give another dose of ammoniac, 20 drops internally; but if the effects have increased, I give no more ammoniac, but I administer three pills in the juice of betel leaves, one every five minutes. After the second or third pill the symptoms ordinarily greatly diminish, and the patient is out of danger.

Such is my usual method of treating the bites of snakes of the first class, but I am assured that the pills alone properly administered succeed perfectly. As I have said above, one or two are broken over the wound, and one or two or even three are taken interiorly in betel juice.

In respect to snakes the bite of which brings on gangrene, and only causes death some time after the accident, I treat the wound in exactly the same manner that I have above described. I then make a mixture of one part of ammoniac to five or six parts of water, and steeping dressings in this ammoniacal water, I apply them to the wound, recommending the patient to keep them continually moistened with the ammoniacal water during 24 hours. I administer also interiorly 20 drops of ammoniac in an ounce of water, repeating the dose two or three times, should this be necessary. I do not give pills for this class of snakes.

For old and gangrened wounds I follow the same course, and under the influence of the dressings of ammoniacal water, one soon sees the gangrene cease and the wound become cicatrized.

By the help of this simple and easy remedy, I have healed old and very severe wounds, and I may affirm that this simple treatment succeeds perfectly in all cases of bites by these kinds of snakes. But it is insufficient for bites by cobras and snakes of the first class.

Such is the treatment, Sir, that I wish to make known to you. May it succeed with others as it has hitherto succeeded with me, and should I have the consolation of contributing to save the lives of some persons, I shall consider myself well rewarded for my trouble and labour.

Proceedings of the Council of the Lieutenant-Governor of Bengal for the purpose of making Laws and Regulations.

Saturday, the 22nd February 1873.

Present:

The Hon'ble G. C. Paul, *Acting Advocate-General, Presiding.*
The Hon'ble F. L. Beaufort.
The Hon'ble V. H. Schalch.
The Hon'ble C. E. Bernard.
The Hon'ble Moulvie Abdool Luteef, Khan Bahadoor.
The Hon'ble B. D. Colvin.
The Hon'ble F. F. Wyman.
The Hon'ble Rajah Joteendro Mohun Tagore, Bahadoor.
The Hon'ble Babu Digumber Mitter.

EMIGRATION TO THE LABOR DISTRICTS.

The Hon'ble Mr. Beaufort said, he begged leave to postpone the motion, which stood in the list of business, that the Bill to amend the law relating to the emigration of laborers to the districts of Assam, Cachar, and Sylhet, and to regulate contract-labor and service, be read in Council. He adopted this course at the suggestion of two hon'ble members, who thought that sufficient time had not been given for the consideration of the Bill. At the same time he would say that he had no idea of pressing on the Bill too rapidly when he proposed to proceed with it that day, for the Bill was in the hands of the members on Saturday last, and it was, as already explained, little more than a re-arrangement of the law which now existed. He believed that the practice of the Council, on the motion to read a Bill, was to confine the debate to the principles of it, and to leave the details for the consideration of the Select Committee; and as the Bill did not propose to interfere with the principles of the present law, it appeared to him unnecessary to invite any lengthened discussion at the present stage. But in deference to the wishes of the two hon'ble members, he had no hesitation in asking leave to postpone the motion, of which he had given notice, for a fortnight.

He would take this opportunity of supplementing what he said at the last meeting in moving for leave to introduce the Bill. He had omitted to refer to one particular section of considerable importance. He had intended to mention the subject on the last occasion, but had forgotten to do so. The section to which he alluded was section 105 of the present Act II of 1870, which appeared in the Bill as section 127. The provision in the present law was, that when a laborer had suffered imprisonment for six months for desertion, that imprisonment should have the effect of cancelling the contract. In this Bill Mr. Beaufort had inserted certain words (which he had taken from a Bill lately laid before the Imperial Council regarding emigration) which very much altered that provision, as it declared that the imprisonment should have that effect if the employer so desired in writing, and not that such imprisonment should of itself operate as a cancelment of the contract. As the words of the Bill stood the contract would not be declared cancelled by reason of the imprisonment unless the employer requested that such order be passed. That was a matter of considerable importance, and was very much discussed in former years in this Council. It attracted the attention of the Government of India and the Secretary of State, and a Bill passed through this Council was rejected, because it did not contain a section providing that a certain term of imprisonment as a punishment for desertion should have the effect of cancelling a contract. He would shortly state the arguments for and against the provision. First as against the provision, it was urged that it was very unjust to place it in the power of one of two contracting parties to determine the contract at his own pleasure to the wrong of the other party; very unjust that the laborer should have it in his power by his own misconduct to free himself from his contract to the serious loss of the employer, possibly with the view of selling his labor at a higher price to another person. On the other hand it was argued that the parties to the contract were not on equal terms when the contract was made. The employer was perfectly aware of the circumstances under which the contract would be carried out, while the laborer had no knowledge, or an erroneous conception, of what was before him. At that time it was believed that the condition of the laborer was often deplorable, and it was considered just under the circumstances that he should have some means of release; and it was said that six months' imprisonment was a full penalty for his offence in breaking his contract. It was also said that the condition of the laborer must be extremely bad when he would voluntarily undergo six months' imprisonment in order to cancel the contract. But the chief argument which weighed with the superior authorities was, that the object and natural result of such a provision of law was to enlist in favour of the laborer the kindness, humanity, and self-interest of the employer. MR. BEAUFORT would not have proposed to alter that provision, after all the discussions which had taken place when the former Bills were under consideration, and the expression of opinion of the higher authorities, but for the following reasons. He had already mentioned that he had taken it from a Bill before the Imperial Council, and it appeared to him that the matter might now be considered from a different point of view. It was generally admitted, he believed, that the condition of laborers in the tea districts at present was very different from what it was at the time when the former Bills were considered. Very great improvement in that respect had taken place, and it might be said with truth of most of the proprietors and managers of tea plantations now that they treated their laborers with great kindness and consideration, and that the life of the laborer now was not the life of misery which it was once described to be. There was another consideration which had also weighed with him. A very large proportion of the laborers now were men who had re-contracted on the spot after the expiration of their original contracts; and of course the considerations which applied to laborers who had entered into their first contract in ignorance would have no proper application to persons who made new contracts after the personal experience of several years. MR. BEAUFORT could not say that he was wholly in favour of the alteration proposed, but its insertion in the Bill would lead to a full discussion of the question by the Select Committee. It was a matter on which the employers had always expressed a very strong opinion, and he trusted that the Select Committee to whom the Bill might be referred, would carefully consider whether the present provision of the law might not be reasonably and equitably open to some modification.

THE HON'BLE MR. COLVIN said, as the hon'ble member in charge of the Bill had assented, in deference to the hon'ble member who usually sat on Mr. Colvin's right (Mr. Robinson) and himself, to postpone for a short period the motion for the reading of this Bill, perhaps he might offer a word of explanation as to his reasons for having made that request. His Honor the President was pleased on the last occasion to direct that the Bill should be published in the Gazette, in order that the changes proposed to be made in the law might be thoroughly considered before the Council proceeded further with the Bill. Although the hon'ble member had explained that the provisions of this Bill did not involve any radical change of principle from previous enactments passed, but was rather a re-arrangement of the existing law with the modifications which he had explained, still it appeared to MR. COLVIN that those modifications were in themselves of no small importance, and might fairly be opened to discussion of such a nature as was usual at this stage. And as the Bill had to a certain extent re-opened the whole question, it was possible that suggestions for other modifications might be made. There was scarcely time for the various public bodies and others interested in the matter here, such as owners and agents of tea estates, owners of tea stock, and coolie contractors, and still less for tea-planters and proprietors at a distance, to submit any expression of their views. Speaking for himself, he might say that he had not had time to go into the subject as thoroughly as he could wish, and he had therefore ventured to ask for some further time for the general consideration of the Bill. He was indebted to the hon'ble member for his acquiescence with that request.

The motion that the Bill be read in Council was then postponed for a fortnight.

EMBANKMENTS AND WATER-COURSES.

The Hon'ble Mr. Schalch moved that the report of the Select Committee appointed to consider certain amendments in the Bill to amend the law relating to embankments and water-courses, be further considered in order to the settlement of the clauses of the Bill. At the last meeting of the Council, the amendments proposed by the hon'ble member opposite (Baboo Degumber Mitter) were discussed and disposed of, and Mr. Schalch now proposed to take up the amendments of which he had given notice.

The motion was agreed to.

The Hon'ble Mr. Schalch said, the first amendment which he proposed, referred to Section 18. By that section provision was made for appending to the proclamation to be issued by the Collector a list of the estates, villages, "and municipalities" mentioned in the notice. The object was to ascertain what municipalities of the first and second classes should be bound as municipalities to contribute towards the expense of maintaining embankments. The creation of first and second class municipalities had now fallen to the ground, and it was therefore proposed that the word "municipalities" should be omitted, landholders within those municipalities bearing their proper share of the expense of maintaining embankments in the same manner as they would bear their share as proprietors of ordinary estates. He therefore moved the omission from line 20 of the words "and municipalities," and the insertion of the word "and" between the words "villages" and "estates."

The motion was agreed to.

The Hon'ble Mr. Schalch said, before going to the next amendment on the list, he thought it would be well to get rid of the other sections which also referred to municipalities. The first of these was Section 44. The proposition was to omit the portion of that section commencing at the 14th line and ending at the word "executed" in the 18th line. The words proposed to be omitted were—

> "Provided that the Collector may, if he thinks fit, order that a portion of the total sum payable shall be paid by any municipality of the first or second class which is, in his opinion, benefited or protected by the works or repairs executed."

The motion was agreed to.

The Hon'ble Mr. Schalch next moved the omission of the second paragraph of Section 46, which referred entirely and solely to municipalities, and was as follows:—

> "Whenever it has been ordered by the Collector that a municipality is liable for a portion of the said total sum, the notice shall contain a statement to that effect, and shall be served on the Chairman of the municipality."

The motion was agreed to.

The Hon'ble Mr. Schalch moved to omit Section 51, which also referred only to municipalities, and was as follows:—

> "The Collector shall likewise determine the amount payable in respect of any municipality rateably, in proportion to the benefit derived by it from the work or repair executed, and the remaining sum shall be apportioned as directed in the two last preceding sections. Provided that no rate-payer in such municipality shall be required to pay any portion of such remaining sum in respect of any tenure which is situated within the limits of such municipality"

The motion was agreed to.

In Section 53 the Hon'ble Mr. Schalch moved the following amendments also relating to municipalities:—

> "To omit the words 'or municipality' in line 2, and to insert the word 'or' between estate' and 'tenure.'

"To omit the words in lines 9 to 13 'And provided also in the case of a municipality that the instalment payable in any one year shall not exceed ten rupees per centum of the total income of such municipality during the year last preceding.'"

The motions were severally agreed to.

THE HON'BLE MR. SCHALCH moved the omission of the second paragraph of Section 57, also referring entirely to municipalities, which was as follows:—

"It shall be lawful for the Commissioners of any municipality to pay to the Collector on the dates fixed by the order passed under Section 54, the sum which is declared in such order to be payable in respect of such municipality; and, for the purpose of realizing the amount so disbursed, to increase the rate of any tax leviable therein."

The motion was agreed to.

THE HON'BLE MR. SCHALCH said, no provision had been made in the Bill for cases where there might be a doubtful jurisdiction as to land situated within two districts. To meet such cases we had adopted the principle laid down in regard to jurisdiction in civil cases, and suggested that where land was situated within the limits of two different districts, the Collector of either district might have jurisdiction on reporting the matter to the Commissioner of the division and receiving his sanction, when it would be competent to the Commissioner to give jurisdiction to either Collector. And where the land lay in two different divisions, it was proposed to allow the Commissioner of either division, with the concurrence of the other, to give authority to proceed in the matter. Nothing, MR. SCHALCH thought, need be mentioned on this subject further than that it was necessary to have some provision for cases that might arise. He would move to introduce the following clause after Section 22:—

"22A. If the lands, which are likely to be affected by any such proposed work, are situated within the limits of different districts, the Engineer may report to the Collector of any district within which any portion of such lands is situated, and such Collector may proceed in respect of all the lands likely to be affected by such work; but in such case he shall apply to the Commissioner of the division for authority to proceed in such matter; and the Commissioner of the division, if all the lands are situated within his division, may give authority to any Collector within whose district any portion of such lands is situated to proceed in the same.

"If the districts, within which the lands likely to be affected by any such work are situated, are subject to the Commissioners of different divisions, the Collector, to whom the Engineer has submitted his report, shall apply to the Commissioner of the division within which his district is situated, and such Commissioner may, with the concurrence of the Commissioner to whom the other district is subject, give authority to proceed in such matter."

The motion was agreed to.

THE HON'BLE MR. SHCALCH then moved the insertion of the following section after Section 27:—

"27A. The provisions of Section 22A shall be applicable to proceedings taken under this Part."

The motion was agreed to.

THE HON'BLE MR. SCHALCH said, the next section in which he proposed an amendment, was section 32 in Part V of the Bill, relating to the acquisition of land. Some difficulty was experienced in Commitee as to how to render the provisions of the Land Acquisition Act of 1870 applicable to cases in which land was taken up under this Bill. The section as it now stood specified the sections of the Land Acquisition Act which were declared applicable. But since the Bill had been in Committee he had had the benefit of consulting with his hon'ble friend opposite (Mr. Beaufort) and others, and it was now considered that the simplest and most perfect way of extending the provisions of that Act to cases under this Bill was to omit all the words from line 5 to the end of the section, "and all the provisions cotained in Sections 10 to 15, 18 to 34, 36, 37, 38, 42, 51, 55, 58 (as amended by Act IX of 1871), and 59 of the Land Acquisition Act, 1870, shall be applicable to such proceedings," and to substitute for them the following words:—

"In accordance with the provisions of the Land Acquisition Act of 1870, or any other law for the time being in force for the acquisition of land for public purposes."

The motion was agreed to.

THE HON'BLE MR. SCHALCH said, Section 35 referred to the case where the taking of land for the purposes of the Act affected rights in other lands or certain other rights. Here also some difficulty was experienced. But after consideration it was thought fit to adopt the following section, which he now moved to substitute for Section 35:—

> "When any such claim is made, proceedings shall be taken in view to determine the amount of compensation, if any, which should be made, and the person to whom the same should be payable, in accordance with the provisions of the Land Acquisition Act, 1870, or any other law for the time being in force for the acquisition of land for public purposes."

The motion was agreed to.

THE HON'BLE MR. SCHALCH said, the next amendment was to omit Sections 37, 38, and 39 of the Bill. Those sections corresponded with Sections 35, 39, and 40 of the Land Acquisition Act. As by the adoption of the previous amendments all the provisions of that Act had been rendered applicable to proceedings under this Bill, it was no longer necessary to retain the sections which he now moved to omit. He therefore moved that they be omitted.

The motion was agreed to.

THE HON'BLE MR. SCHALCH said, he now came to the amendment to insert a new section after Section 41. Section 41 referred to the duty of the Government to maintain certain embankments entered in the schedule annexed to the Bill. In addition to the embankments therein specified, there was one other case in which the Government considered themselves pledged to contribute towards the maintenance of embankments in the two purganas of Futtehsing and Rokanpore. He was aware of the circumstance when the schedule was drafted; but under the impression that this Bill did not bear on those embankments, no provision was made for it. But he had since been led to believe that doubts might be thrown on the intention of the Government in omitting any mention to such contributions, and it might be supposed that they were desirous of avoiding what they considered to be their obligations. Consequently, to remove all doubts, he proposed to insert the section of which he had given notice. He would take up the time of the Council for a few moments to give a history of the contributions made on account of embankments in these purganas. So far back as 1790, or even a few years before, mention was made in the records of the contribution of Sicca Rupees 1,375, which was then made to the zemindars towards keeping up embankments in the Rokanpore purgana, and of Sicca Rupees 1,600 for the same purpose in Futtehsing. These contributions were paid for a long time. He found them the subject of enquiry in 1834, when in the report of the local authorities it was stated that these embankments were not repaired for years.

The local authorities were of opinion, therefore, considering that the condition on which the contribution was made was not fulfilled, that the contribution should cease to be paid. The Board, however, were of opinion that the contribution should be continued, the responsibility of the maintenance of embankments resting as hitherto upon the zemindars. That proposition was accepted by the Government, and from that time a sum in Company's Rupees equivalent to the contribution then made, had been paid to the zemindars. Those embankments had not been hitherto taken up as public embankments, and it was probable that they were not of such importance as to render it necessary that they should be so taken up. It was therefore proposed that so long as they remained not public embankments, the contribution should be made. If hereafter it should be found necessary to take them up as public embankments, then it was proposed that from that time the contribution should be formed into a fund to be appropriated to the repair and maintenance of the embankments, and any balance at the end of one year remaining unexpended should be carried towards the fund of the next year. If it was found that the contributions were not sufficient, then, after deducting from the expense the amount credited to the fund, the balance would be recovered from the zemindars under the provisions of this Bill. It was then further declared that if it should be found that the embankments were not necessary, then the contribution would cease. But so long as any embankment was kept up, the contribution would be paid as it had hitherto been done. He thought he need say nothing further, except that he had made an alteration in the latter part of the proposed section, which, as at present worded, might be held to constitute the Collector the final authority in determining the necessity or otherwise of the embankments. Another alteration he would propose was the substitution at the end of the new section of "any embankment" for "the embankments." The intention was that the contribution should be revived, if it was found that the maintenance of any one embankment had again become necessary. MR. SCHALCH then moved the introduction of the following section after Section 41:—

"41A. In accordance with the custom heretofore in force in respect of the purganas entered in schedule F annexed to this Act, the Government shall continue to contribute annually the sum noted therein for each purgana respectively towards the maintenance of the embankments thereof.

"If the embankments maintained in any such purgana shall at any time be declared to be public embankments under the provisions of Section 4, the Collector shall, from the date of such declaration, keep a separate account for such purgana, in which the aforesaid sum shall be credited at the commencement of each financial year. The unexpended balance at the close of each year shall be carried on to the credit of the account in the next succeeding year, and shall be available for the cost of repairing or erecting all the embankments which it may be deemed necessary to maintain in such purgana.

"If at any time after the passing of this Act, on an enquiry made by the Collector, as far as possible in accordance with the provisions of Part III, it shall be found that it is unnecessary for the public interest to retain any embankment in either of the said purganas, the Lieutenant-Governor may direct that such contribution shall cease in respect of such purgana. Provided that such contribution shall again be made in accordance with the provisions hereinbefore contained, if it shall appear to the Lieutenant-Governor, on the report of an enquiry similarly conducted, that the maintenance of any embankment in such purgana has again become necessary for the public interest."

THE HON'BLE MR. SCHALCH said, Section 49 provided for the apportionment of expenses. He moved the addition to the section of the following clause, to provide that in the case of these two purganas the apportionment should be made after deducting the amount of contribution:—

"Provided also that the sum standing to the credit of a purgana in Schedule F in the account kept by the Collector at the time when the total amount payable is fixed under the provisions of Section 44, shall be deducted from the total amount payable in respect of such portion of any embankment as is situated in such purgana; and that the zemindars of the estates situated therein shall be charged only with the balance of the amount (if any) which may remain payable."

The motion was agreed to.

THE HON'BLE MR. BEAUFORT said, Section 66 provided that no order of a Collector and no payment made by him in proceedings taken under the provisions of the Bill should be admissible in a Civil Court as evidence that the person named therein as the zemindar or proprietor of any estate or tenure was the zemindar or proprietor of such estate or tenure. It appeared to him unnecessary to introduce into the law a provision of that nature. It might be that the evidence afforded by the finding of the Collector would, under the circumstances, be of little value; but, whatever the value of the evidence might be, it should be allowed to stand for what it was worth. Certainly no Court could reasonably rely on that evidence alone; but to exclude it altogether from consideration was to throw a slur on the proceedings of the Collector and to say that no reliance could be placed on them, or in other words to presume that the decision of the officer to whom so much power was given by the Bill, would be inequitable and fundamentally bad. MR. BEAUFORT moved that the section be omitted, which would leave it to the parties to make what use they could of proceedings taken under the Bill.

THE HON'BLE MR. SCHALCH observed that there was no objection to the omission of the section. It was only introduced to satisfy the fears of some hon'ble members that Munsifs and other Judges of inferior grade might, unless some provision of that kind was made, admit altogether irrelevant evidence. But as the hon'ble member considered the section unnecessary, MR. SCHALCH had no objection to its omission.

The motion was agreed to.

THE HON'BLE MR. SCHALCH said, with regard to Schedule E, which referred to those embankments which the Government were bound to maintain, he would prefer to have a little further time to enable him to show exactly why the Government had accepted the obligation of maintaining those embankments and no others. He was still looking through the papers, and he should now like to postpone the further consideration of the Bill until the next meeting of the Council.

On the suggestion of the Acting Advocate-General, a verbal amendment was made in Section 40, and the further consideration of the Bill was then postponed to the next meeting.

The Council was adjourned to Saturday, the 1st March.

Saturday, the 1st March 1873.

Present:

HIS HONOR THE LIEUTENANT-GOVERNOR OF BENGAL, *Presiding.*
The Hon'ble G. C. PAUL, *Acting Advocate-General.*
The Hon'ble F. L. BEAUFORT,
The Hon'ble C. E. BERNARD,
The Hon'ble MOULVIE ABDOOL LUTEEF, KHAN BAHADOOR,
The Hon'ble B. D. COLVIN,
The Hon'ble T. M. ROBINSON,
AND
The Hon'ble RAJAH JOTEENDRO MOHUN TAGORE, BAHADOOR.

MOFUSSIL MUNICIPALITIES.

THE HON'BLE MR. BEAUFORT presented the report of the Select Committee on the Bill to amend the District Municipal Improvement Act and the District Towns' Act. He said the Council would remember that the object of the first section of the original Bill was to authorize the election of Municipal Commissioners in municipalities under the District Municipal Improvement Act. The Select Committee were of opinion that wherever the principle of election—the system of self-government—was admitted, it should be so admitted as to afford a fair prospect of success, and that that would not be the case if the number of elected Commissioners were smaller than the number of Commissioners appointed by the Government. The Committee therefore recommended that not less than two-thirds of the Commissioners should be elected, if it were directed that any Commissioners at all were to be elected. The number of Commisioners under the District Municipal Improvement Act was unlimited. The minimum number was fixed at seven, exclusive of certain ex officio Commissioners; but any number of Commissioners might be appointed, and therefore without some restriction the elected Commissioners might at any time be overwhelmed. The Committee also proposed that the rate-payers who were to be allowed to vote at such elections should be those who have paid the tax on houses, buildings, and lands. Act III of 1864 also allowed the levy of a tax on carriages, horses, and elephants, but the Select Committee were of opinion that persons paying a tax of that kind merely from the accident of having carriages, horses, or elephants, were not entitled to vote at the election of Commissioners, and that the qualification for a vote should be confined to persons holding a substantial interest in the municipality, viz. those who paid the tax on houses, buildings, and lands. The Select Committee also proposed to introduce a section declaring that the term of office of a Commissioner should be limited to three years, and providing for the rotation of Commissioners. Under the proposed section, at the end of three years a Commissioner would *ipso facto* vacate his appointment; but that would not prevent his re-election or re-appointment. The rules for the rotation of Commissioners under Act III of 1864, proposed by the Select Committee, were similar to those which were provided in the other municipal law, Act VI of 1868.

The third section of the Bill as amended referred to the election of the Vice-Chairman. The Committee was of opinion that whenever Municipal Commissioners were elected under section 1, the Vice-Chairman should always be elected; and another clause had been introduced to enable them to get rid of an objectionable Vice-Chairman by the vote of two-thirds of the Commissioners. The 4th and 5th clauses were the same as in the original Bill, with the exception of the words providing that the Commissioners under Act III of 1864 might expend a portion of the fund on the establishment and maintenance of hospitals or dispensaries and in the promotion of vaccination. At the time of drafting this Bill, it was forgotten that Bengal Act VII of 1867 had already provided for the expenditure of municipal money on such objects. Sections 4 and 5 therefore were confined to the application of a portion of the municipal fund in the establishment and maintenance of schools. A proviso was added to the original Bill with the object of securing the voluntary action of the municipal bodies in the expenditure of their money on schools; but the Select Committee were of opinion that the same principle should be applied to expenditure of money on hospitals, dispensaries, and vaccination; and a new section had been added in that view, providing that no portion of the municipal fund should be expended on any of these objects without the consent of a majority of the directors of the fund There was a clerical error in the Bill as amended. The words "this Act" had been left out. The consequence was that as the section stood it would apply to the old Acts only and not to the Bill. It was merely a clerical error, and would be corrected on the proper occasion.

The only other point in the report of the Committee to which he need refer was the introduction of the new section 7. Under the present system the municipal year, if he might use the expression, was different under different enactments. By Act III of 1864 the first day of the year was fixed for the 1st of May, and in the Act regulating the expense of police in towns—Bengal Act VI of 1867—which was in fact an amendment of Act III of 1864, the 1st day of January was fixed as the first day of the year. Under Act XXVI of 1850, the application of which was now very limited, but which was still extant, the 1st of May was declared to be the first day of the year. These different dates led to some confusion, and it might also be found convenient to alter the date of the municipal year for other reasons. For instance, the executive works to which the attention of municipal bodies was chiefly confined, were carried on immediately after the rains, and it might be convenient that the municipal year should commence at that time, in order that the estimates might correspond with the seasons. It was therefore proposed to introduce a section giving power to the Government to alter the date for the commencement of the year, and to declare on what dates the accounts and estimates should be furnished. The section as it stood in the amended Bill was, however, confined to the two Acts, III of 1864 and VI of 1868, and he would on the proper occasion propose to substitute for it another section extending the application of it to all the municipal laws.

Since the report of the Select Committee had been prepared—in fact only yesterday—a letter was received from the Municipal Commissioners of the Suburbs, proposing the enactment of provisions for the registration of births and deaths. The Committee had had no opportunity of considering that communication. That might be a very suitable and proper provision to introduce in the Suburbs of Calcutta. The registration of births and deaths was now enforced in Calcutta under Act VI of 1863; and it might be very advisable that a similar system of registration should be introduced in the suburbs and in other places. But whether the Council would sanction such rules, and whether it would think fit to introduce provisions for that purpose in this Bill or in a separate enactment, it would be for the Council to say. If it was thought expedient to introduce them into the present Bill, the best course to adopt would probably be to refer the Bill back to the Committee for the consideration of that point; and with that view he would make a formal proposal now, that the Bill should be referred back to the Committee for a report on the proposition contained in the letter from the Suburban Municipality.

HIS HONOR THE PRESIDENT said, before putting the question he wished to say for himself that he was extremely indebted to the Select Committee for their labours and the improvements they had made in the Bill. He thought that the changes which the Committee had made were decided improvements, and would materially relieve the Government from responsibility. It was entirely right and proper that the system of election should be tried in a manner most favorable to success; that if election be tried, it be tried in a substantial manner; that the tax-payers should have the right of election in the case of two-thirds of the Committee and of their Vice-Chairman. He also thought it was an extremely desirable arrangement that the election of members should be made by all the rate-payers at large, by all those owning or occupying property and charged with the payment of rates, and who had paid the rates. That was the view which he would have taken if on him had rested the determination of fixing the qualification of electors; but in so fixing it, the Committee had relieved the Government of considerable responsibility.

HIS HONOR was also extremely willing to accept the proposal that endowments for the support of hospitals and dispensaries, and for the promotion of vaccination, should be voluntary, as it was proposed expenditure on account of education should be. With reference to the observations which fell from him on a former occasion—he was alluding to the suggestion that if the Committee thought fit, municipalities under Act III of 1854 should have the option, at their choice, of imposing taxation on the property and means of the inhabitants, as provided by Act VI of 1868, instead of a rate on houses, buildings, and lands—that proposal, he understood, did not meet with favor with some of the members; he understood that the native members of the Committee were decidedly opposed to it. As HIS HONOR had said before, he did not seek by the influence of Government to press this upon the Council. He might say, therefore, that since the native members, as representing the native community, were averse to allowing this option in the mode of taxation, we should not attempt to press that view of the matter.

Then there remained only this letter from the Municipal Commissioners of the Suburbs regarding the registration of births and deaths. The Chairman and the Commissioners were, it appeared, decidedly of opinion that some provision should be made for procuring these statistics of births and deaths. HIS HONOR believed that as far as their municipality and probably some other towns similarly situated were concerned, they were right in thinking that some provision should be made for such registration. At the same time it was doubtful whether this Bill was in a shape suitable for making sufficient provision of that kind. The course taken by the Government was, that they almost despaired of getting reliable mortuary statistics from the whole country, and in order to obtain statistics somewhat reliable, we had selected certain specimen areas in Bengal, both town and country, and had attempted to obtain good mortuary statistics from those selected areas. From some areas we also proposed to obtain statistics of births; our hope being that in that way we might arrive at a correct conclusion of the birth and death-rate in the country,—a conclusion which we should not hope to arrive at if we attempted to deal with the whole population of Bengal. The question therefore was, whether it would not be better to legislate for all these localities, and not only for towns under the several Municipal Acts. He thought on the whole it would be best to receive the report of the Committee which was now presented, but to ask the same Committee to consider the letter of the Suburban Municipality and make a recommendation expressing their opinion on the subject. If the Committee should be of opinion that a provision of that kind would be with advantage incorporated in this Bill, it should be referred back to them with the view of carrying out that change. If the Committee should be of opinion that the subject should be dealt with separately, we should be prepared to introduce a Bill carrying out that view which on examination might be found prudent and sufficient for the purpose.

The question that the letter from the Municipal Commissioners of the Suburbs be referred to the Select Committee, and that the Committee be requested to express their opinion on the provision of law suggested by the Commissioners, was then put and agreed to.

EMBANKMENTS AND WATER-COURSES.

THE HON'BLE MR. BERNARD said he was requested by the hon'ble member in charge of the Bill to amend the law relating to embankments and water-courses, who was unfortunately unable to be present at this meeting, to state that it was his intention to postpone the motion which stood in his name on the list of business. Mr. Schalch was at present not fully prepared to explain to the Council the schedule of embankments which the Government was bound to maintain. When the information on the subject was ready, he hoped to circulate it to the members, and in the mean time it was proposed to postpone the motion before the Council. MR. BERNARD understood that the hon'ble member on his left (Moulvie Abdool Luteef) had also consented to postpone the amendment of which he had given notice.

SALE OF ABKAREE LICENSES.

THE HON'BLE MR. BEAUFORT moved for leave to bring in a Bill to amend section 9 of Act XI of 1849, and section 27 of Act XXI of 1856. He said those were two Abkaree Acts, one referring to Calcutta and the other to the mofussil. The Board of Revenue had lately determined to put up to public auction licenses to hold abkaree shops. But a doubt had arisen whether the wording of these laws would justify the Board in selling licenses by auction. Under the strict wording of the law, the Board must first fix the price to be paid for a license, whereas the price would be fixed by the bidding if they were sold to the highest bidder. And therefore he would ask the Council for leave to introduce a short Bill, the object of which was to enable the Board of Revenue to sell such licenses by auction. The Bill was not printed yet, but he might say that he merely proposed to introduce two new sections in lieu of the two sections referred to in the title of the Bill. The law of the mofussil in one section appeared to permit such sales; but in section 27, so far as it referred to the sale of European spirits, a difficulty arose on the wording, and the same was the case in section 9 of the Calcutta Act XI of 1849. He had in the list of business a notice that he intended to ask the President to suspend the rules for the conduct of business in order that the Bill might be at once read in Council. But as it appeared that there was no need of precipitation in the matter, he would not propose to hurry the action of the Council. He would not therefore ask for the suspension of the rules, but would now merely move for leave to bring in the Bill.

HIS HONOR the PRESIDENT said, although this Bill was a small Bill, it was a Bill which touched upon an extremely important subject. It was not only a subject of great importance, but it was a subject of great complication and great difficulty. It was a subject which had puzzled the Legislature of England for a long time past, and which puzzled us now. He was sure that hon'ble members within the walls of this Council, and others outside, who had the welfare and good of the country at heart, must be convinced that nothing was so desirable as to check the excessive consumption of spirits, and with that view the abkaree or excise system had been worked. For some time past we had been anxious to check the growth of consumption, and to remove the imputation of making the vices and weakness of the people administer to the increase of the revenue. The general principle of the measures of Government in this respect had been, as far as possible, to decrease the consumption and increase the tax upon spirits. Considering that a tax upon vices was the most legitimate of all taxes, if by decreasing the consumption we obtained the same or even a smaller revenue, we would be doing a great good to the people. The course for some time adopted was that taken in England, namely, to restrict the number of licenses. But that system was necessarily accompanied by one considerable difficulty, namely, that as the number of licenses was decreased, so the value of the licenses was increased. You had a large publican interest all over the world, and as licenses increased in value, the result was great jobbery and difficulty in regard to the disposal of those licenses. All those who had to do with English politics, general or social, were aware that in England there was no subject of political jobbery so great as the system of licenses to publicans. The number of licenses being limited and valuable in proportion, it followed that it was a matter of favor to give a license, and that became the subject ofgreat political and social jobbery. Although in this country jobbery to such an extent did not prevail, still here also we were liable to jobbery of one kind or another, and the Government wished, whilst obtaining a legitimate revenue from the sale of spirits and checking the consumption, to remove the possibility of jobbery as far as it could be done. Consequently we had thought it right to attempt the proposed system of selling licenses, which possessed one noted advantage, that favor should be shown to no man; that the number of licenses should be limited; that the number being so limited, the benefit of holding a license should be put up to auction, with a proviso that the purchaser should be a man of respectability. That system had been attempted in several mofussil districts. The general abkaree law of the mofussil, passed in 1856, did. as the hon'ble member had told the Council, admit of that system; but when we came to apply it to Calcutta, where under our own eyes the experiment could best be tried, we found that the law by its letter did not make provision for a system of that kind, but laid down one fixed and rigid rule, that the price for a license should be laid down by the Board of Revenue. We were not aware that our hands were tied up, and licenses were advertised for sale. When the matter was pointed out, it was determined that licenses should be granted only for three months. That would afford time to enable the Council to consider the question. The Bill was designed to untie the hands of the Government so as to permit them to do in Calcutta what they could do in the mofussil, namely, to put up licenses to auction and give them, not as a matter of favor, but to the highest bidders, provided they were respectable men of approved character. In the general Akbaree Act, although provision was made for the sale by auction of licenses for country spirits, no such provision was made for the sale of European spirits. It was well known that of late years a low class of brandies had been imported to compete with country spirits, and it was desirable that licenses for the sale of these spirits should be put upon the same footing. The Bill provided for these two points. It provided for the trial of the system of sale by auction in Calcutta, and put foreign spirits on the same footing as country spirits in the mofussil. It was a small Bill, and would, he thought, most likely meet with general approval. But all over the world the publicans were known to be a powerful body. They held a valuable interest in their hands. The monopolists who had valuable interests would no doubt strive to defend them. He could not hope that the Bill would be passed without opposition on their part. He would not precipitate the consideration of the Bill, but he trusted the members of the Council would, considering the great importance of the matter, give it their best consideration, and that we should come to a just and wise decision undismayed by the cries of monopolists or any one else; we should do what was best for the country in general, for morality, and the good of the mass of the people.

The motion was agreed to.

The Council wasadjourned to Saturday, the 8th instant, at 11 A.M.

PATNA COMMISSIONER'S CIRCULAR ON THE REORGANIZATION OF THE EDUCATIONAL MACHINERY AND THE ESTABLISHMENT OF A SOUND SYSTEM OF PRIMARY EDUCATION.

Circular No. 378, dated Bankipore, the 21st November 1872.

From—S C. Bayley, Esq., Offg Commissioner of Patna,
To—All Magistrates of this Division.

No. 220T, dated 14th October 1872.
No. 3521 A 3 } Forwarding two resolutions of 30th September.
No. 3521 A 4 }

I have the honor to invite your special attention to the Government circulars noted on the margin, which deal with two subjects.

1st.—The reorganization of the educational machinery throughout the country.

2nd.—The expenditure of funds for establishing a sound system of primary education.

2. You will observe that middle and lower class education, in fact all education save that of the Government colleges, is now brought under the direct superintendence and control of the district officer.

3. School Committee have to be formed at each district head-quarters to assist him, and the present local Committees of Public Instruction will form the nucleus of these Committees, and the district officer will be Vice-President and the working officer of the Committee. You are requested to send me up the names of men of influence and intelligence in various parts of the district, whom you would propose to add to the Committee. It should be made as strong as possible, so that the intentions and action of Government in this matter may be understood through the district at large and not merely explained to a few persons at the sudder station.

4. The Government permits also the formation of Sub-divisional Committees, and seeing how great a share the sub-divisional officer will have in carrying out this great work, I am strongly in favor of having such Committees wherever possible. You are requested to report hereafter how far this object is attainable, but your first duty will be to get together a strong and intelligent distinct Committee, and you will nominate either the Head Master of the District School or some other educational officer to be its Secretary. I see no objection to retaining the present Secretary though not an educational officer, where such a course may seem advisable, as *e. g.*, in Tirhoot where Mr. Gordon's services in this capacity would be invaluable, a clerk will be allowed where necessary.

5. You will observe that the Committee's special and important business will be with the higher and middle class Government schools in the district. They will recommend through the Inspector the distribution of funds for these schools, and will nominate to all masterships in such schools under Rs. 50. Their duties in connection with primary schools will be to advise the Magistrate in regard to the disbursement of grants for these schools, and their assistance in this respect and in the establishment of new primary schools ought to be prominently invited. They will also assist the Magistrate in the supervision of Normal Schools. They will have to submit their annual returns and report to the Commissioner, sending a duplicate to the Inspector of the division.

6. In regard to the distribution of funds by the Committee it is to be observed that the local management of aided schools by their own Secretary and Committee under the grant-in-aid rules remains untouched, and I request that you will call attention to the terms offered in paragraph 8 of the resolution on the reorganization of the educational service which vests in municipalities full control and management over those schools to which they are willing to contribute a sum equal to, or more than, that of the Government grant.

7. Besides these Committees (whose duties save that they have the all important power of the purpose, would be mainly consultative) the Magistrate will have as his immediate subordinate the Deputy Inspector of Schools.

8. A Deputy Inspector will be appointed to each district, the present arrangement by which one Deputy Inspector has to work the two districts of Shahabad and Patna being in my opinion no longer possible, and immediate application will be made for the serwices of an extra Deputy Inspector for

Shahabad. He will be the executive officer immediataly under the Magistrate and the sub-deputies under him should be attached similarly to sub-divisional officers as far as possible though where there are many sub-divisions in a district, each Deputy Inspector will have to work two or more sub-divisions.

9. The Deputy Inspector will submit accounts and returns through the Magistrate, and his reports of inspection in schools under the Committee will also go through the same officer as Vice-President of the Committee to the inspector of the division.

10. The Normal Schools will be under the control of the Magistrate acting with the advice of the Committee, and I shall be obliged by a report from each district in regard to paragraph 9 of the same resolution as to whether the Collegiate and High Schools should remain (where there are any) under the circle inspector, or under the educational committee.

11. The Inspectors will nominate to all masterships paid from Rs. 50 to 200, but the Committee will apparently have to be consulted in regard to appointments above Rs. 200, the nomination as for which will be sent up by the Director of Public Instruction to Government.

12. The Magistrates will appoint all masters in *training* and *primary* schools drawing less than Rs. 50 a month.

13. Such being an outline of the machinery provided by Government, I have to request you to lose no time in bringing it into motion; the points requiring immediate attention in this matter are—

1st.—To select and nominate District Committees.

2nd.—To report on the possibility of forming Sub-divisional Committees.

3rd.—To nominate a Secretary for the District Committee.

4th.—To endeavour under paragraph 8 to induce municipalities to qualify for, and take over, the control of their schools.

5th.—To lay out a line of work of Deputy Inspectors, communicating your proposals to the Inspector.

6th.—To report where necessary upon paragraph 9 of the resolution.

14. I now come to the provision made by Government for a system of primary education in every district, and as the success of this very important scheme will depend almost wholly on the energy and intelligence which the district officer brings to bear upon it, I cannot too strongly urge upon you not only carefully to study the resolution, but to make its effective operation the prominent object of your own cold weather tour and of those of your subordinates.

15. It will be observed that for the work of primary education the Lieutenant-Governor assigns to this division for expenditure during the remaining portion of this and the whole of the ensuing year, the sums noted in the magin, and he looks to us to establish schools in addition to those* assigned in July to something like the following extent.

	1872-73. Rs.	1873-74. Rs.		Total. Rs.
Patna	2,400	7.200	=	9,600
Gya	3,000	9,000	=	12,000
Shahabad	2,800	8,400	=	11,200
Tirhoot	6,000	18,000	=	24,000
Sarun	3,000	9,000	=	12,000
Chumparun ...	2,200	6,600	=	8,800

* Patna	163 + 30
Gya	200 + 38
Shahabad	190 + 30
Tirhoot	400 + 70
Sarun	200 + 30
Chumparun	150

16. The resolution lays down with all possible distinctness what the object is that Government have in view, viz., by a system of grants to multiply and somewhat improve the existing class of indigenous schools, but not to introduce a new kind of schools, nor to any extent new subjects of teaching. The great aim and object is to teach reading, writing, and arithmetic in the indigineous language of the province, to practise the boys in the native system of accounts, and teach them something of mensuration and the native system of land survey; and the instruments to be used as teaching are men of the indigenous schoolmaster class, who will be content with emoluments of Rs. 8 or 10 a month, and not the higher class of masters hitherto turned out by our training schools, who will be content neither with the low wages of gurus nor with the native system of teaching. The conditions to be insisted upon are efficiency according to native standards and submission to periodical inspections and

examinations by Government officers; and on those conditions being agreed to, grants may be given to existing schools to some extent, and should be offered to a much larger extent to persons willing to start fresh schools where they are wanted.

17. Grants should in no case exceed Rs. 5 a month, and generally should be as low as Rs. 2 or 3 a month, which would probably be quite enough to induce the *gurus* of existing schools to submit to the conditions to be imposed. The assistance expected by Government from wards' estates and municipalities should not be lost sight of, and you should take full advantage of the Government orders in this respect in the endeavour to establish new schools and to bring the old ones under inspection.

18. You will observe that the Lieutenant-Governor does not insist on all the old gurumahashoys being brought in for training to a training class, but he thinks that for all the new teachers who may be appointed, and for the younger gurus of existing schools, this should also be made a condition.

19. As to the nature and standard of teaching which we should aim at, I commend to your perusal Mr. Clark's report on indigenous education in Mymensing, which is published as an appendix to the resolution, and I beg that you will bear steadily in mind that existing materials and existing systems are to be made use of as much as possible; and that we should not insist on printed books superseding oral repetition and writing paper taking the place of the plantain leaf or dust. Even in such things as regular hours and registers of attendance, we should be very tender to native habits and prejudices. I dwell on this subject not because it is left out of the resolution, but because the subordinate officers of the education department, who will in this matter serve as your hands and eyes, have naturally enough acquired a very marked dislike and contempt for the unmethodical and primitive methods of indigenous teaching, and constrasting it with the improved system under which they have been taught, will, unless carefully checked, endeavour to substitute for it something better perhaps, but wholly different and acceptable neither to the habits nor the means of the class we wish to reach.

20. You should therefore draw out a very simple list of the conditions and on which grants are to be given, including, where you think fit in the case of gurus or meeahjees, the enforced attendance for a few months at a training class. You will observe that during this attendance at the training class the guru will continue to draw the Government grant though he must provide a substitute for his school.

21. Having drawn out these conditions you should, I think, circulate them as widely as possible during your approaching tour, on which you should be accompanied by the Deputy Inspector of your district, and you should make it your special object to select old schools and establish new ones as you move about, and then and there commence the system of grants which Government wish to introduce.

You should direct your sub-divisional officers to assist you in this, carrying out these instructions so far as applicable during their tour, and reporting to you week by week what progress they make, and I request that you will furnish me similarly with monthly reports of the action taken by you to carry out the orders of Government.

22. As regards the class of persons to be selected to start new schools, experience will show you who can be induced and who can be trusted to start them. I do not myself think underpaid putwaris likely to be successful schoolmasters in addition to their other duties and occupations, but there are in many villages persons who have been putwaris, or taids to putwaris, or who are, as it were seconded putwaris, and this might frequently be made use of. But generally gurumohashoys have relations or pupils who may be induced to set up school in a neighbouring village, and where influential residents assist, the choice will of course be left mainly to them. I do not wish either to fetter you in regard to the proportion in which you would distribute the funds allotted to you; you will find paragraph 11, I think, a useful sketch outline which you can vary or fill up as you please. I only wish to remind

you that the work should be commenced at once and pushed on as rapidly as possible, and to call attention to the following expression of the Lieutenant-Governor's wishes :—

"When the system develops, when the rural municipalities undertake schools with Government assistance, when the demand for and means of education increase, more money may be available, and we may attempt more schools. The object of the present grants is to make a beginning of mass education in the country, and the Lieutenant-Governor hopes to be assured that the money is well spent. He would rather have an assurance of this kind and a demand for more money than be told it has not been possible effectively to spend what is now given."

23. There remain several points which I should like you to consider in communication with the circle inspector and report about. First, as to indigenous teaching for Mahomedans. The Lieutenant-Governor says similar grants may be given to mukhtubs, but will it be possible to get the indigenous teacher in these schools to teach Hindi and useful acquirements, instead of what they now do. Again, is the Lieutenant-Governor's suggestion, that a fair proportion of Mahomedan teachers are to be appointed, consistent with the enforced teaching of Nagree and Kaithee. I should like a careful report as to the best arrangements to be made for *primary* education among Mahomedans. Next, as to starting training classes at districts and sub-divisional head-quarters, and inducing gurus to join them. The means of doing this requires consideration, and on this point I should like you to propose a scheme suited to the circumstances of your district and submit it, as well as the report called for in the preceding paragraph, through the circle inspector to me.

Another point to which I think attention may usefully be directed, is the expediency of taking an educational census in selected villages in each sub-division. What we should require to know is (1) the proportion of boys of a school-going age to the whole population of the village; (2) the proportion actually at schools of different kinds; and (3) the proportion who have picked up instruction without going regularly to school. If to this was added the total proportion of the population who could read and write Hindi, it could give us a useful standard to mark our progress by in the future and a means of comparing one district with another.

24. I shall also be glad to be favored with your views on the question of selecting a limited tract as proposed by the Lieutenant-Governor and saturating it, so to speak, as a model of educational district. I should prefer for the present expending our funds in the widest possible diffusion of primary schools, but there is something also to be said from an experimental point of view on the side of concentration, and if you would prefer directing a portion of your funds to this purpose, I will not oppose.

RESOLUTION ON THE PRINTING BUDGET FOR 1873-74.

FINANCIAL DEPARTMENT.

Calcutta, the 28th February 1873.

READ—

A letter No. 919C, dated the 15th February 1873, from the Accountant-General, submitting with his remarks the budget estimates for "printing" for the year 1873-74.

1. The figures under the several sub-heads of the "printing department" budget are as follows:—

	Actuals of 1871-72.	Grants sanctioned for 1872-73.	Accountant-General's budget, 1873-74.
	Rs	Rs.	Rs.
Bengal Secretariat	77,669	69,000	85,000
Miscellaneous Departments	10,008	2,15,000	1,62,550
Government Publications	24,349	24,000	35,800
Postage Charges	4,413	5,000	....
Total	1,16,439	3,13,000	2,83,350

The great difference between the "actuals" of 1871-72 and the estimates of the two following years is due to the circumstance that for the earlier year the value and the cost of work done for Government at the Alipore Jail Press was kept out of the provincial accounts. The Lieutenant-Governor has since considered it right that the Jail Department should receive credit for the work done by the Alipore Press, so long as the work is valued at reasonable rates. In the year 1871-72 the actual outturn of the Alipore Jail Press was valued at Rs. 1,13,383; for the year 1872-73 it was estimated at Rs. 2,05,000; and it is taken at Rs. 1,50,450 for the coming year 1873-74. The Lieutenant-Governor has, however, no information of the mode of arriving at these figures, and they must be accepted with reserve.

2. *Bengal Secretariat.*—There is an increase of Rs. 16,000 under this head, of which Rs. 8,000 are on account of establishment and contingencies, and Rs. 8,000 are for the purchase of new type and printing material. The increase on account of establishments and contingencies has been rendered necessary by the great increase in the current work of the office, and is accepted by the Lieutenant-Governor.

3. *Miscellaneous Departments.*—There is a net decrease of Rs. 52,450 under this head. The Alipore Jail Press estimate shows a decrease of Rs. 54,550, while there is a small increase of Rs. 2,100 for "printing at private presses." The decrease in the estimate of receipts for the Alipore Jail Press is due mainly to the revision and reduction of the tariff at which the work is valued. The Accountant-General's estimate under this head is accepted.

4. *Government Publications.*—The Lieutenant-Governor accepts the figures under this head; the provision of Rs. 12,000 for miscellaneous publications during the coming year is allowed.

5. No separate provision has been allowed for "postage charges," the expenditure having been included in the estimate with the contingencies of the gazettes.

6. The sanctioned budget will then stand thus—

	Accountant-General's estimate.	Sanctioned budget grant.
	Rs.	Rs.
Bengal Secretariat	85,000	85,000
Miscellaneous Departments	1,62,550	1,62,550
Government Publications	35,800	35,800
Total ...	2,83,350	2,83,350

Ordered, that a copy of this resolution be published in the *Calcutta Gazette*, and that copies of the resolution and of the Accountant-General's letter and enclosures be forwarded to the Judicial (Jails) Department of this Office and to the Accountant-General and to the Inspector-General of Jails for information.

APPLICATION FOR PECUNIARY ASSISTANCE TO THE CHITTAGONG MUNICIPALITY.

No. 1209, dated Calcutta, the 3rd March 1873.

From—A. Mackenzie, Esq., Officiating Secretary to the Government of Bengal in the Judicial Department.

To—The Officiating Commissioner of Chittagong.

I am directed to acknowledge the receipt of your letter No. 35, dated the 28th ultimo, submitting an application for pecuniary assistance from the Chairman of the Chittagong Municipality.

2. In reply I am desired to say that this is only one case out of several in which the Lieutenant-Governor has very recently found that difficulties have arisen from the fact that the Road Cess Act very properly limits the expenditure of the funds raised under it to the country from which those funds are taken. In Bengal, as in other parts of India, district money has sometimes been largely devoted to the chief towns and stations. Formerly, in Bengal, the local funds of the whole province were first amalgamated, and then distributed at the discretion of the Public Works Department. Under this arrangement favored districts got much, though they often collected little; and less favored districts got little. Then again the funds assigned were spent in both town and country, but the chief stations often got a lion's share. At the time of the passing of the Road Cess Act it was intended that the towns which are excluded from the operation of the Act should bear their own burdens, and the consequence no doubt is that the Municipalities find some roads thrown on their hands which were heretofore kept up with other money. The Lieutenant-Governor's attention has only lately been specially drawn to this state of things. It seems to him that the towns are able to bear their own burden, and should do so. Not only is it fair that they should, but the funds hitherto used indiscriminately having been assigned to their own proper localities, there are no permanent means of assisting Municipalities. At any rate, any little special and temporary assistance that may be possible must be confined to very special cases in which there is not only very special necessity, but in which it is shown that the Municipalities have already exhausted their resources and their present taxing powers. This last precaution is very necessary. A little time ago when the Lieutenant-Governor objected to the Darjeeling Municipality spending capital instead of income, and an appeal was made on account of the peculiar circumstances of the place and extreme poverty. His Honor found, on looking into the matter, that there was scarcely any local taxation; the Municipality having contrived to live on extraneous grants.

3. In Chittagong, though there is a considerable house-rate, an appeal is now made on account of what is called an "indigent" Municipality, without the house-rate having been raised to the maximum allowed, or any effort having been made to try other sources of taxation allowed by Act III (B.C.) of 1864, under which the Municipality is constituted. Chittagong is a most rising place of trade, and the wealth created by the trade gives opportunities for taxation

to meet its necessities. Probably labor of all kinds commands higher rates there than in almost any part of these provinces, whilst rice, the food of the people, is cheap. The Lieutenant-Governor can imagine no place to which the term "indigent" can less properly be applied, or which could better bear the small maximum of taxation at present allowed by law. The Government already contributes to the Municipal police in consideration of the marine work to be done. No more is done for any other Municipality, and the Lieutenant-Governor thinks it impossible that Government should accept any other burden as a permanent arrangement. The town must pay for its own needs.

4. In consideration, however, of the fact that owing to the rapid extension of its trade, &c., Chittagong may be said to be in a sort of transition state, the Lieutenant-Governor will be willing to give something, once for all, out of money now in hand, on condition that the Municipality do their utmost in the way of taxation, that is, raise the maximum possible under the present law. On that condition he will be prepared to place Rs. 30,000 at the disposal of the Municipality to be spent on permanent improvements, and on the understanding that the money is not to be applied to the purpose of lessening the burden of ordinary maintenance.

No 35, dated Camp Comillah, the 28th January 1873.

From—H. Hankey, Esq., Commissioner of the Chittagong Division,
To—The Offg. Secretary to the Government of Bengal, Judicial Department.

In submitting the accompanying letter from the Chairman of the Chittagong Municipality, I must beg the indulgence of His Honor the Lieutenant-Governor for again importuning the Government for pecuniary assistance on behalf of this indigent Municipality.

2. I venture to make a second appeal on its behalf, because I think there are many circumstances connected with its condition that entitle it to exceptional treatment and consideration at the hands of the Government. It is a place of more than local importance, and, as the Collector has truly remarked, the place is no longer what it was, an ordinary district head-quarter station, with a harbour visited by a few country-craft; it is becoming a large rice port, with a trade which is daily increasing, and proportionately swelling the custom revenue derived therefrom.

3. In former days head-quarter stations used to receive large grants from Government for the execution of necessary works, and new places like Chittagong, with little internal wealth, are beginning to feel the effects of their desertion. As a port, Chittagong receives no assistance whatever from the Government, and its trade, whilst largely increasing imperial finances, adds nothing to the municipal resources. On the contrary, it may be said to have the opposite effect, since it compels the Municipality to pay its quota for providing European constabulary necessitated by the flourishing condition of its port, and entailing an expenditure which is not made up to it by proportionately increased receipt.

4. The Chairman of the Municipality has not exaggerated the urgent demand that exists for money, and unless some assistance be given the urgency cannot but increase. I see that Rs. 10,000 has been estimated for repair to pucca roads, but this sum is in my opinion *altogether inadequate* to the purpose. Important pucca roads are obliged to be left unrepaired, because the Municipality literally have not the means, either present or prospective, to spend a rupee upon them. The work numbered 1 in the accompanying statement is a most important one, but cannot be taken in hand. The consequence is, that one of the principal thoroughfares has been closed for upwards of a year.

5. There is no station that I know of in more need of assistance than Chittagong, and I trust the state of the provincial finances will admit of some help being accorded.

No. 17, dated Chittagong, the 22nd January 1873.

From—A. L. Clay, Esq., Chairman of the Municipality, Chittagong,
To—H. Hankey, Esq., Commissioner of the Chittagong Division.

In accordance with a resolution adopted at a meeting of the Chittagong Municipal Committee held on the 11th instant, I have the honor to forward herewith a statement of certain works the construction of which is most urgently required, but cannot be undertaken by the Municipality for want of funds. The list is not supposed to be exhaustive, but merely exhibits some of the most necessary works. To put and maintain in thoroughly efficient order all communications, bridges, drains, &c., within municipal limits, would probably entail an expenditure of several lakhs of rupees.

2. The total amount, you will observe, comes to Rs. 51,150, or about half a lakh. Our balance in the treasury on the 16th of this month, after paying bills for November and December, amounted to Rs. 722-7-6 only. How very inadequate our resources are to meet the heavy demands that are made upon them, will be recognized from the fact that our total annual income during the current year is estimated at Rs. 19,354-5-8 only, of which Rs. 9,922 have been allotted to public works.

3. On a former occasion I made application for a grant of money from Government (*vide* this office No. 42, dated 6th March 1872), but the reply communicated with your No. 98, dated 13th April last, was to the effect that Government was not in a position to make such allotment of funds, and it was suggested that our police expenditure might be reduced. It had been my intention to effect a reduction under this head, and since I last wrote this has been done. The force has been reduced by twelve constables; a monthly saving of Rs. 86 being effected by this arrangement. It would be impossible to retrench further without sacrificing efficiency; and indeed had our finances been in a more flourshing condition, I should have been unwilling to reduce to the extent that we have done, for the town is a large and straggling place, and requires a strong force of police to discharge the duties of watch and ward effectively.

4. It is difficult to see where any further saving is possible. Our office road, conservancy, and pound establishments are none of them large, and the conservancy establishment is utterly inadequate to the requirements of the place, consisting as it does of two carts and sweepers, who are supposed to do scavenging work daily over an area of about 7½ square miles. It will be seen that an increase under this head has been provided for in the statement herewith submitted.

5. Our house-tax is already fixed at 6 per cent. on annual value, and as the maximum rate allowed by law is only 7½ per cent., it is not desirable to raise the assessment. The income of the Municipality may be capable of some improvement by a judicious levy of certain cesses, (*e.g.*, wheel and boat-tax, &c.) not hitherto imposed, and it is my intention to request the finance sub-committee to direct their attention to this matter. But that our income from local sources, however carefully developed, can ever be sufficient to enable us to keep the town in even tolerable order, is not to be expected.

6. The statement herewith forwarded speaks for itself, column 2 showing in each case the necessity for the projected work. I would, however, especially request your attention to the first item, as very clearly illustrating the impecunious condition to which we have been reduced. The bridge referred to, situated on one of the main throughfares of the town, leading past the central distillery, the Judge's cutcherry, and the Government school, was found to be in an unsafe condition, and accordingly dismantled in April last, since which time it has not been renewed simply because there was *no money for the work*. All wheel traffic on the road has of course been stopped, and pedestrians have to walk across the nullah that was formerly spanned by the bridge.

7. You are aware that from the physical peculiarities of the place, the construction and maintenance of roads, bridges, &c., is exceptionally costly in Chittagong. The soil is sandy; the rainfall heavy; and the ground, hilly and broken; there being scarcely any part of the station that is absolutely level. Consequently expensive protection works (revetment walls, extra wing walls, pucka side-drains, stone-dams, &c) are necessary, that would not be required in a less hilly place. During the rains, the metalling of those roads that we can afford to make pucca has to be constantly repaired and renewed, being absolutely torn up by the mere surface water rushing down some of the steeper inclines. I have seen this myself where the side-drainage was ample, and it is simply the rain falling on the road that did the damage.

8. Another very expensive item is wood-work for rails. The station abounds in deep khals and yawning chasms, many of them large enough to take in a three-horse omnibus, or even a much larger vehicle. Some of these have been protected by railings, but many more have not, and cannot be till we have money to do it. I could point out a dozen places any morning in an hour's walk where the absence of any sort of barrier involves actual danger to persons riding or driving along the roads; and even the railings that we have are many of them so old and ricketty as to be of little or no use, and should be renewed, did our funds permit.

9. I trust I have said enough to show that our position is one of exceptional difficulty and embarrassment, and hope you will very strongly urge upon Government the necessity of

reconsidering our application for assistance. We have no wealthy and public-spirited residents here, who, like Khajah Abdool Gunny and his son Khajah Ahsonoollah of Dacca, would come forward with a lakh-and-a-half of rupees to be spent on local improvements. Were there any chance of success, I would try what could be done by local subscription; but our experience of native liberality in the case of the charitable dispensary teaches us to expect nothing from this source.

10. I believe there are some Municipalities, with far greater resources than we possess, such as Berhampore and Patna, that receive large annual subsidies from Government. Rs. 3,000 per annum is the extent of assistance that we receive, and this, though very acceptable as far as it goes, does not materially improve our position.

11. It is believed that the finances of the Bengal Government are just now in a flourishing condition, and I think you will agree with me that some portion of the available surplus might be usefully applied in relieving the necessities of Chittagong. We are not in a position to negociate a loan, which while affording temporary relief, would eventually add to our embarrassment. It is therefore necessary to ask for an unconditional grant, and looking at the work to be done, I do not think the figure should be less than half a lakh. Should Government not be prepared to allot so large a sum at once, I would suggest that an additional yearly allowance of Rs. 7,000 be conceded, which, with the Rs. 3,000 already paid, would give us a total annual subsidy of Rs. 10,000. With this amount of assistance, though little could be done at once, works of improvement might gradually be undertaken, and in time the results would be apparent.

12. The town and port of Chittagong are year by year rising in importance, and the place is no longer what it was some years ago—an ordinary district head-quarters station, with a habour visited by a few coasting craft. The Government derive increased revenue from the increased trade of the port, and it is only just that some portion of this should be devoted to the improvement of the town.

ACCOUNT OF THE SETTLEMENT OF A DIFFERENCE BETWEEN AN ASSAMESE AND SOME NAGAS.

No. 11, dated Gowhatty, the 18th February 1873.

From—Colonel H. Hopkinson, Agent to Governor-General, North-East Frontier, and Commissioner of Assam.

To—The Offg. Secy. to the Govt. of Bengal, Political Department.

I have the honor to submit copy of a curious account* from the Deputy Commissioner of Seebsaugor of the settlement of a difference between an Assamese and some Nagas, which I think His Honor the Lieutenant-Governor may read with some interest. It is satisfactory to find the Nagas listening to reason and making reparation, as they have done in this case; but the origin of the difference seems to me the most noticeable part of the business. It is startling to find one of the most peculiar and imaginative of the superstitious beliefs which were rife in Europe some centuries ago, flourishing now-a-days among the Nagas with every detail of it identical and complete.

* No. 2, dated 14th February 1873.

No. 2, dated Camp Golaghat, the 14th February 1873.

From—Major A. E. Campbell, Deputy Commr., Seebsaugor.

To—The Personal Asst. to the Commr. of Assam, Gowhatty.

Referring to a conversation I had with the Commissioner when at Jorehaut regarding a case in which the Banfera Nagas had forcibly taken a buffalo from a ryot of the Bag Maria village in Obhoypore, Borooahchali mouzah, I have the honor to report that on the 5th instant a deputation of the tribe, whose names are entered in the margin, came to my camp, when, in the presence of the complainant, I held an inquiry.

Alie.
Monjoo.
Nokjan.
Poochoi.
Poonghi.
Apang.

2. The Nagas did not deny taking the property stated by the complainant, but held that it was given willingly, and their story was as follows.

About a year ago the complainant used to fish in the same stream as they, the Nagas, did, and one day had a quarrel with one of the tribe, when blows were exchanged. This quarrel was settled by the chief of the tribe, each party being obliged to pay something, which was buried, when their differences were supposed to cease.

The Nagas, however, say the complainant never would let the Naga with whom he had a quarrel alone, but in fact haunted him; and when one day he (the Naga) was cutting some flesh off a bullock which had died, he (the Assamese) looked on, which a Hindoo ought not to have done, he, moreover, made an image of the Naga which he tortured by *piercing it with a thorn and holding it over the fire.*

From that day the Naga sickened, and eventually died.

The Nagas then, in December last, to the number of 30, went to this man's village and wanted him to go to the chang, but on his refusing, the Nagas state he gave up a buffalo, a piece of cloth, some ducks, and dhan, but complainant denies this, and said all the property was taken by force, and which I believe was the case

3. I pointed out to the Nagas that there was no occasion for such a number of them to go to the village, if the property was given willingly, and that at any rate without my permission no property could be given up in that manner, and I therefore said they must settle the matter with the complainant.

4. A kind of punchayet was formed with the mouzadar at the head, and the case was mutually settled by the Nagas agreeing to pay the complainant Rs. 100 at Seebsaugor.

The complainant having stated that he would be satisfied with that amount, I directed the Nagas to swear that all differences were at an end, which they did by biting a tiger's tooth.

On their return to Seebsaugor they paid the money, Rs. 100, to the complainant in the presence of the Assistant Commissioner

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No. 1225, dated Calcutta, the 4th March 1873.

From—L. C. Abbott, Esq., Offg. Under-Secy. to the Government of Bengal.
To—The Commissioner of Assam.

I am directed to acknowledge the receipt of your letter No. 11 of the 18th ultimo, with its enclosure from the Deputy Commissioner of Seebsaugor, giving an account of the settlement of a difference between an Assamese and some Nagas. The account is certainly curious and interesting. The Lieutenant-Governor presumes the case is the one which was referred to in the 5th paragraph of your annual report No. 27GT, dated the 22nd January last.